STRUCTURE GEOTECHNICAL REPORT
CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 33 (PROPOSED SN 016-1822)
F.A.I ROUTE 90/94 (KENNEDY EXPRESSWAY)
IDOT D-91-227-13/ PTB 163-001
COOK COUNTY, ILLINOIS

For

AECOM

303 East Wacker Drive

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Submitted by

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Original: April 5, 2019
Revised: November 19, 2019

Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report Circle Interchange Reconstruction Retaining Wall 33, F.A.I. Route 90/94 Station 8682+70.28 to Station 8684+50.28		**2. Report Date** Original: April 5, 2019 Revised: November 19, 2019 **3. Report Type** ☒ SGR ☐ RGR ☐ Draft ☒ Final ☒ Revised
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6. PTB / Item No. 163/001	**7. Existing Structure Number(s)** No existing wall	**8. Proposed Structure Number(s)** 016-1822
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11. Abstract

To facilitate the reconstruction of Circle Interchange, Retaining Wall 33 will be constructed along the Washington Exit Ramp. The proposed Retaining Wall 33 includes a combination of the existing cast-in-place (CIP) retaining wall and new MSE wall. The north portion of the existing 120-foot long CIP wall will be partially removed on the top and replaced with a concrete parapet and anchorage slab. The new MSE wall will be constructed after removing south portion of the existing 60-foot CIP wall, footings, and partial removal of metal shell piles. The MSE wall will have a maximum total height of 10.3 feet.

Beneath the pavement, the subsurface soils consists of up to 2 to 16 feet of fill materials, up to 2.5 feet stiff clay crust, up to 33 feet of very soft to medium stiff silty clay, 33 feet of stiff to very stiff clay to silty clay loam, and 34 feet of hard silty clay loam or dense to very dense silt to silty loam and sand extending to the boring termination depths or bedrock. Sound bedrock was encountered at an elevation of about 481.5 feet. Groundwater was not encountered within the fill layers; however it should be expected between elevations of 588 to 583 feet. Groundwater is also present within the granular layers just above the top of bedrock.

The proposed MSE wall is feasible with the use of Class III LCCF fill material and the normal weight portion of the overall embankment behind the MSE wall be laid back so it does not exert any earth pressure on the LCCF backfill that is to be placed behind the LCCF MSE mass. The wall will have a maximum factored bearing resistance of 1,400 psf using a geotechnical resistance factor of 0.65. The global stability analyses show factor of safety of 2.5 and 2.4 satisfying the IDOT minimum required FOS of 1.5. Considering the unloading and reloading effect and the use of LCCF, the settlement is not a concern.

For the construction of MSE wall, the temporary excavation with a side slope of 1:2 (V:H) will have a FOS of 1.6. It should be noted that the existing Retaining Wall 22 foundation is close proximity of the temporary excavation slope. Therefore, the extra care should be taken during temporary excavation not to undermine the Retaining Wall 22 foundation.

12. Path to archived file

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1.0 INTRODUCTION

This report presents the results of Wang Engineering, Inc. (Wang) subsurface investigation, laboratory testing, geotechnical engineering evaluations and recommendations for a new retaining wall, designated as SN 016-1822 (Retaining Wall 33) proposed along the Washington Exit Ramp in connection with the Circle Interchange Reconstruction project in the City of Chicago, Cook County, Illinois. A *Site Location Map* is presented as Exhibit 1.

The purpose of our investigation was to characterize the site soil and groundwater conditions, perform geotechnical engineering analyses, and provide recommendations for the design and construction of the new wall structure.

1.1 Project Description

The Circle Interchange is over 50 years old and has significant congestion and safety problems. The project is aiming to improve safety and mobility as well as upgrade the mainline and interchange facilities. The project will also improve other modes of transportation such as transit, pedestrians and bicyclists within the same corridor.

The Circle Interchange Reconstruction project is along Interstate 90/94 (I-90/94) from south of Roosevelt Road to north of Lake Street, along Interstate 290 (I-290) from Loomis Street to the Circle Interchange; and along Congress Parkway from the Circle Interchange to Canal Street/Old Post Office. The routes typically have three lanes of traffic in each direction with mostly one lane ramp at interchanges. Locally, the north leg is known as the Kennedy Expressway, the south leg as the Dan Ryan Expressway and the west leg as the Eisenhower Expressway. Within the project area, there are

several cross street bridges over I-90/94 and I-290 considered for reconstruction. Along I-90/94, from south to north, the cross street overpasses include Taylor Street, Van Buren Street, Jackson Boulevard, and Adams Street. Along I-290, from west to east, the cross street overpasses include Morgan Street, Peoria Street, and Halsted Street.

The proposed improvements include additional through lanes in each direction on I-90/94. The horizontal alignment and vertical profiles throughout the interchange will be improved. A new two-lane flyover, Ramp NW (Flyover) will be constructed for I-90/94 northbound to I-290 westbound traffic. Cross street bridges, Morgan Street, Harrison Street, Halsted Street, Peoria Street, Taylor Street, Adams Street, Jackson Boulevard, and Van Buren Street will be reconstructed. Various existing ramps will be reconstructed and up to fifty new retaining walls will be constructed.

1.2 Proposed Structure

Based on the Type, Size, and Location (TSL) plan dated April 4, 2019 provided by TranSystems Corporation (TranSystems), the proposed Retaining Wall 33 (SN 016-1822) will support the Washington Street Exit Ramp. It will be 180 feet long built along the same alignment of the existing Retaining Wall 21, where a 120-foot northern section of the wall will be partially removed on the top and replaced with a concrete parapet and anchorage slab, with the remaining southern 60-foot section be fully removed and replaced with a new Mechanically Stabilized Earth (MSE) wall. The MSE wall begins at Station 8682+70.28 and ends at Station 8683+30.28 with an offset of 20.23 feet left, and will have a maximum total height of 10.3 feet. The TSL plan is included in the *Appendix D*.

1.3 Existing Structure

There existing CIP Retaining Wall 21 was constructed in 1957, and is 180 feet long supported on spread footings and metal shell piles constructed in 1957. In order to build the MSE wall at the southern section, the existing wall and footings will be fully removed, with partial removal of the existing metal shell pile foundations. There is also an existing CIP Retaining Wall 22 about 30 feet offset east from the proposed MSE wall alignment.

2.0 SITE CONDITIONS AND GEOLOGICAL SETTING

The site is located within the City of Chicago at the I-90/94 and I-290 Circle Interchange. On the USGS *Chicago Loop 7.5 Minute Series* map, the wall is located in the NE¼ of Section 16, Tier 39 N, Range 14 E of the Third Principal Meridian.

The following review of published geologic data, with emphasis on factors that might influence the design and construction of the proposed engineering works, is meant to place the project area within a geological framework and confirm the dependability and consistency of the present subsurface investigation results. For the study of the regional geologic framework, Wang considered northeastern Illinois in general and Cook County in particular. Exhibit 2 illustrates the *Site and Regional Geology*.

2.1 Physiography

The wall is situated within the Chicago Lake Plain Physiographic Subsection. The area is characterized by a flat surface that slopes gently toward the lake, largely made of groundmoraine till covered by thin and discontinuous lacustrine silt and clay. The ground elevation along the wall ranges from 586 feet at the south end to 595 feet at the north end.

2.2 Surficial Cover

The project area was shaped during the Wisconsinan-age glaciation, and more than 75-foot thick drift covers the bedrock (Leetaru et al. 2004). The glacial cover is made up of clay and silt of the Equality Formation of the Mason Group and diamictons of the Wadsworth and Lemont Formations of the Wedron Group (Hansel and Johnson 1996). The Equality Formation is made up of bedded silt and clay, locally laminated, with lenses and/or thin beds of sand and gravel. The Wadsworth Formation consists of relatively homogenous, massive, gray till with clay to silty clay matrix, with dolostone and shale clasts and occasional lenses of sorted and stratified silt. The Wadsworth Formation is underlain by the pebbly silty clay loam to silty loam diamicton of the Yorkville Member of the Lemont Formation, known informally as the Chicago “hardpan.”

From a geotechnical viewpoint, the Equality Formation is characterized by low strength, medium to high plasticity, and medium to high moisture content, whereas the Wadsworth Formation is characterized by low plasticity, medium to low moisture content, medium to very stiff consistency, poor permeability, and low compressibility. The Yorkville Member (hardpan) is characterized by low plasticity, high blow counts, and low moisture content (Bauer et al. 1991; Peck and Reed 1954).

2.3 Bedrock

In the project area, the glacigenic deposits unconformably rest over approximately 350-foot thick Silurian-age dolostone (Leetaru et al 2004). The top of bedrock may be encountered at about 480 feet elevation or 95 feet below ground surface (bgs) or more. The Silurian dolostone dips gently eastward

at a pace of 15 feet per mile. Only inactive faults are known in the area, and the seismic risk is minimal (Leetaru et al. 2004; Willman 1971). There are no records of mining activity in the area, but deep tunnel excavations are known to exist.

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area revealed the native sediments consist of clay to silty clay diamicton of the Wadsworth Formation resting on top of more competent silty clay loam diamicton (hardpan) of the Lemont Formation, which in turn is underlain by bedrock. Sound dolostone bedrock was sampled at a depth of 112.5 feet bgs, corresponding to 481.5 feet elevation, within the predicted range based on published geological data.

3.0 METHODS OF INVESTIGATION

The following sections outline the subsurface and laboratory investigations. All elevations in this report are based on NAVD 1988.

3.1 Subsurface Investigation

Wang drilled two structure borings, designated as 33-RWB-01 and 33-RWB-02 drilled in June and July 2014. Wang has also referenced three nearby structure borings, designated as 32-RWB-02, 32-RWB-03, and 32-RWB-03B, one Shelby tube boring, designated as 32-ST-01 drilled in June to October 2014. Wang also performed Boring VST-03 to obtain in-situ vane shear strength of soft clay. The as-drilled boring locations were surveyed by Dynasty Group, Inc. and station and offset information for each boring were provided by AECOM. Boring location data are presented in the *Boring Logs* (Appendix A). The as-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 3).

ATV- and truck-mounted drilling rigs equipped with hollow stem augers, were used to advance and maintain an open borehole to 10 feet depth after that mud rotary was used to the boring termination depth. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils.*" The soil was sampled at 2.5-foot intervals to 30 feet bgs and at 5-foot intervals to boring termination depths. Soil samples collected from each sampling interval were placed in sealed jars and transported to Wang Geotechnical Laboratory in Lombard, Illinois for further examination and laboratory testing.

Field boring logs, prepared and maintained by a Wang engineer or geologist, include lithological descriptions, visual-manual soil/rock classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, results of Standard Penetration Tests (SPT) recorded as blows per 6 inches of penetration. The SPT N value, shown on the soil profile, is the sum of the second and third blows per 6 inches. The soils were described and classified according to Illinois Division of Highways (IDH) Textural Classification system. The field logs were finalized by an experienced engineering geologist after verifying the field visual classifications and laboratory test results.

Groundwater observations were made during drilling to a depth of 10 feet before using rotary wash method. Due to safety considerations, boreholes were backfilled with grout immediately upon completion.

3.2 Vane Shear Tests

Wang performed vane shear tests in Boring VST-03. Boring VST-03 is located about 600 feet south of Wall 33.Vane shear tests were performed in undisturbed and remolded conditions using calibrated RocTest vane shear equipment. The sensitivity shown on the boring logs is the ratio of shear strength in undisturbed and remolded conditions. In general, the vane shear values for soft clays were significantly higher than the corresponding values from unconfined compressive strength tests using the RIMAC apparatus. Vane shear test results were used on our engineering analyses.

3.3 Laboratory Testing

The soil samples were tested in the laboratory for moisture content (AASHTO T265). Atterberg limits (AASHTO T 89/T 90) and particle size analyses (AASHTO T 88) tests were performed on selected soil samples representing the main soil layers encountered during the investigation. Shelby tube samples from Borings 32-RWB-03B and 32-ST-01 were tested for unconfined compressive strength (T208), triaxial unconsolidated undrained compression (T296), and one-dimensional consolidation (T216). Field visual descriptions of the soil samples were verified in the laboratory. Laboratory test results are shown in the *Boring Logs* (Appendix A), in the *Soil Profile* (Exhibit 4), and in the *Laboratory Test Results* (Appendix B).

4.0 RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

Detailed descriptions of the soil conditions encountered during our subsurface investigation are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profile* (Exhibit 4). Please note

that strata contact lines represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

4.1 Soil Conditions

Borings drilled on the Washington Exit Ramp encountered 4 to 5 inches of asphalt overlying 7 to 14 inches of concrete followed by crushed stone or sandy gravel base course. Boring 32-RWB-02 encountered 12 inches of asphalt overlying silty clay loam fill. In descending order, the general lithologic succession encountered beneath the pavement structure: 1) man-made ground (fill); 2) very stiff silty clay to silty clay loam; 3) very soft to medium stiff clay to silty clay; 4) stiff to very stiff clay to silty clay loam; 5) hard silty clay loam and medium dense to very dense silt to silty loam and sand; and 6) strong dolostone.

1) Man-made ground (fill)

Underneath the pavement structure, the borings encountered 2 to 16 feet of fill materials. Granular fill consists of loose to dense, gray crushed stone to brown sand to sandy gravel. Cohesive fill includes soft to very stiff, brown to gray silty clay to silty clay loam. The granular fill layer has N-values of 6 to over 50 blows per foot and moisture content values of 4 to 26%. The cohesive fill layer has unconfined compressive strength (Q_u) values of 0.4 to 2.1 tsf and moisture content values of 19 to 24%.

2) Stiff silty clay to silty clay loam

Beneath the fill, at elevations of 582.9 to 578.5 feet, the borings encountered 2.5-foot thick of stiff, brown to gray silty clay to silty clay loam. This layer has Q_u values of 1.0 to 1.23 tsf and moisture content value of 24%.

3) Very soft to medium stiff clay to silty clay

At elevations of 576.0 to 580.9 feet (3 to 18 feet bgs), the borings revealed up to 33 feet of very soft to medium stiff, gray clay to silty clay with Rimac Q_u values of 0.16 to 0.74 tsf and moisture content values of 21 to 32%. Laboratory unconsolidated undrained triaxial tests show shear strength values of 288 to 720 psf. Laboratory index testing on samples from this layer showed liquid limit (L_L) values of 32 to 39% and plastic limit (P_L) values of 15 to 18%. This layer is commonly known as the "*Chicago Blue Clay*."

As discussed in Section 3.2, undrained shear strength values from vane shear tests are generally higher than Rimac tests. In-situ undisturbed vane shear strengths obtained in Boring VST-03 between elevations 574 and 542 feet ranged from 370 to 1680 psf.

4) Stiff to very stiff clay to silty clay loam

At elevations of 542 to 552 feet (32 to 52 feet bgs), the borings encountered up to 33 feet of stiff to very stiff clay to silty clay loam. The unit has Q_u values of 1.0 to 2.6 tsf and moisture content values of 12 to 24%.

(5) Hard silty loam and medium dense to very dense silt to silty loam and sand

At elevation of 515.3 feet (79 feet bgs), Boring 33-RWB-02 encountered up to 34 feet of hard silty loam, medium dense to very dense silt to silty loam and very dense sand. This layer has Q_u value of 4.4 to 10.3 tsf, moisture content values of 10 to 11%, and N values of 28 to over 50 blows per foot.

(6) Strong dolostone

Boring 33-RWB-02 encountered strong bedrock at elevation of 481.5 feet or 112.5 feet bgs. Based on the 10-foot rock core obtained from the boring, the measured RQD value is 86% corresponding good rock quality. *Bedrock core photograph is* shown in Appendix A.

4.2 Groundwater Conditions

Groundwater was not observed during drilling or after drilling in borings due to the mud rotary drilling from 10 feet bgs. Groundwater may be perched within the granular fill layers. Water-bearing silt and gravel layers may also be present at deeper levels. A Piezometer 30-PZ-01 was installed for the nearby structure about 600 feet south of the proposed retaining wall 33 on November 21, 2014 and monitored until March 2017. The screen was placed with the top and bottom elevations at 503.7 and 493.7 feet (89.5 to 99.5 feet bgs), respectively within granular layers above bedrock. Piezometer readings show an average water table elevation of 545.8 feet indicating under hydrostatic pressure within the granular deposit encountered on top of the bedrock.

Although groundwater was not observed within upper fill layers, we anticipate perched water may be encountered during times of heavy precipitation. Therefore, the design and construction of the wall should consider the perched water between 588 and 583 feet elevations within the fill layers.

4.3 Seismic Design Considerations

The retaining wall is located in Seismic Performance Zone (SPZ) 1 and is not required to be designed for seismic forces as per 2012 IDOT *Bridge Manual* (IDOT 2012).

5.0 ANALYSIS AND RECOMMENDATIONS

5.1 Retaining Wall Type Evaluation

Based on the TSL plan, the proposed Retaining Wall 33 includes a combination of the existing cast-in-place (CIP) retaining wall and new MSE wall. A 120-foot long northern section of the existing CIP Retaining Wall 21 will be partially removed on the top and replaced with a concrete parapet and anchorage slab. A new 60-foot long MSE wall will be constructed between Stations 8682+70.28 and 8683+30.28 in the southern section. The existing wall and footings along this alignment will be fully removed. Based on existing Retaining Wall 21 drawings, there is also the presence of existing metal shell piles about a 10-foot length from the wall transition which will also need to be cut off about 1-foot below the top of leveling pad and buried to accommodate the MSE wall construction. The MSE wall will have a maximum total height of 10.3 feet.

The following sections present the results of our geotechnical engineering analyses and recommendations for the MSE wall design and construction.

5.2 MSE Wall

The MSE retaining wall base should be established a minimum of 3.5 feet below the finished grade at the front face of the wall for frost protection.

5.2.1 Bearing Resistance and External Stability Analyses

Based on our boring data, the foundation soils at the MSE wall base elevations consist of about 3.5 feet of granular fill overlying up to 30 feet of soft to medium stiff clay to silty clay. We estimate, without foundation treatment, the soils will have a nominal bearing resistance of 2,200 psf and a factored bearing resistance of 1,400 psf based on a geotechnical resistance factor of 0.65 (AASHTO 2017).

We have considered reinforcement lengths equal to 70 percent of the total wall height or a minimum of 8 feet. We analyzed several alternatives for the fill material to be used in the reinforcement zone and fill area with a 1:2 (V:H) excavation back-slope, as follows:

1. Using regular fill material (unit weight of 125 pcf) for the MSE wall zone and fill area; and
2. Using IDOT District One Class III Lightweight Cellular Concrete Fill (LCCF) for the MSE wall reinforcement zone and laid back excavation back-slope.

For Option 1, at the highest portion of the wall near Station 8683+30.28, the wall will apply a maximum factored equivalent bearing pressure of 3,000 psf with a regular MSE wall fill material (unit weight is 125 pcf) which exceeds the factored bearing resistance available, thus Option 1 is not feasible.

In Option 2, to reduce the applied wall pressure, we have considered IDOT District One Special Provisions Class III LCCF with as-cast density ranging from 36 to 44 pcf for the MSE wall zone and on top laid back excavation back-slope, thus no lateral pressure exerted on MSE wall. We estimate the wall will apply a maximum equivalent factored bearing pressure of 1,300 psf; thus, the foundation soils will have sufficient bearing resistance to support the wall and have an adequate resistance against sliding.

The estimated friction angle between an MSE wall base and underlying cohesive soil is 30º, and the corresponding friction coefficient is 0.58. MSE retaining walls are designed based on a geotechnical sliding resistance factor of 1.0 for soil-on-soil contact (AASHTO 2017).

We recommend Option 2 with 0.7 H reinforcement width for the extended wall section. It should be noted that the normal weight portion of the overall embankment behind the wall system be laid back so it does not exert any earth pressure on the LCCF backfill that is to be placed behind the LCCF MSE mass.

5.2.2 Settlement Analyses

For Option 2, considering the unloading and reloading effect and the placement of LCCF, the applied service pressure will be less than the existing pressure. Therefore, the settlement is not concern.

5.2.3 Global Stability Analyses

Global stability analysis was performed for the MSE wall maximum height section at Station 8383+30.28 with total height of 10.3 feet for both short-tem (undrained) and long-term (drained) conditions, with Class III LCCF. The computer program, SLIDE Version 6.0, was used to calculate the factor of safety (FOS). We estimate the maximum wall section has a short-term FOS of 2.5 and a

long-term FOS of 2.4 (Appendix C-1 and C-2), therefore satisfying the IDOT minimum required FOS of 1.5.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Excavation

Any required excavations should be performed in accordance with local, state, and federal regulations including current OSHA regulations. The potential effect of ground movements upon nearby structures and utilities should be considered during construction.

A slope stability analysis of the temporary excavation with a side slope of 1:2 (V:H) was performed to simulate construction. The analysis resulted in a FOS of 1.6 (Appendix C-3). It should be noted that there is an existing Retaining Wall 22 about 30 feet offset east of proposed Retaining Wall 33. Based on existing Retaining Wall 22 drawings, the wall is supported on deep foundations. We recommend that extra care should be taken during temporary excavation not to undermine it.

Temporary soil retention system will be required to construct the proposed MSE wall as shown on the TSL Plan. The temporary soil retention system will be designed by the Contractor.

6.2 Dewatering

Based on the results of our investigation and proposed excavation for the wall, perched water is likely to be encountered during construction during times of heavy precipitation which should be removed through conventional sump and pump methods.

6.3 Filling and Backfilling

All fill and backfill materials will be as per IDOT *Standard Specification for Road and Bridge Construction* (IDOT 2016).

6.4 Wall Construction

The wall should be constructed as per IDOT *Standard Specification for Road and Bridge Construction* (IDOT 2016). Class III LCCF should be as per IDOT District One special provision.

6.5 Construction Monitoring

There is no need for special construction monitoring for the retaining wall except normally required by the IDOT *Standard Specification for Road and Bridge Construction* (IDOT 2016).

7.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 3. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until the course of construction. In the event that any changes in the design and/or location of Retaining Wall 33 (SN016-1822) are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist AECOM and the Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

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Exp. 11/30/2021

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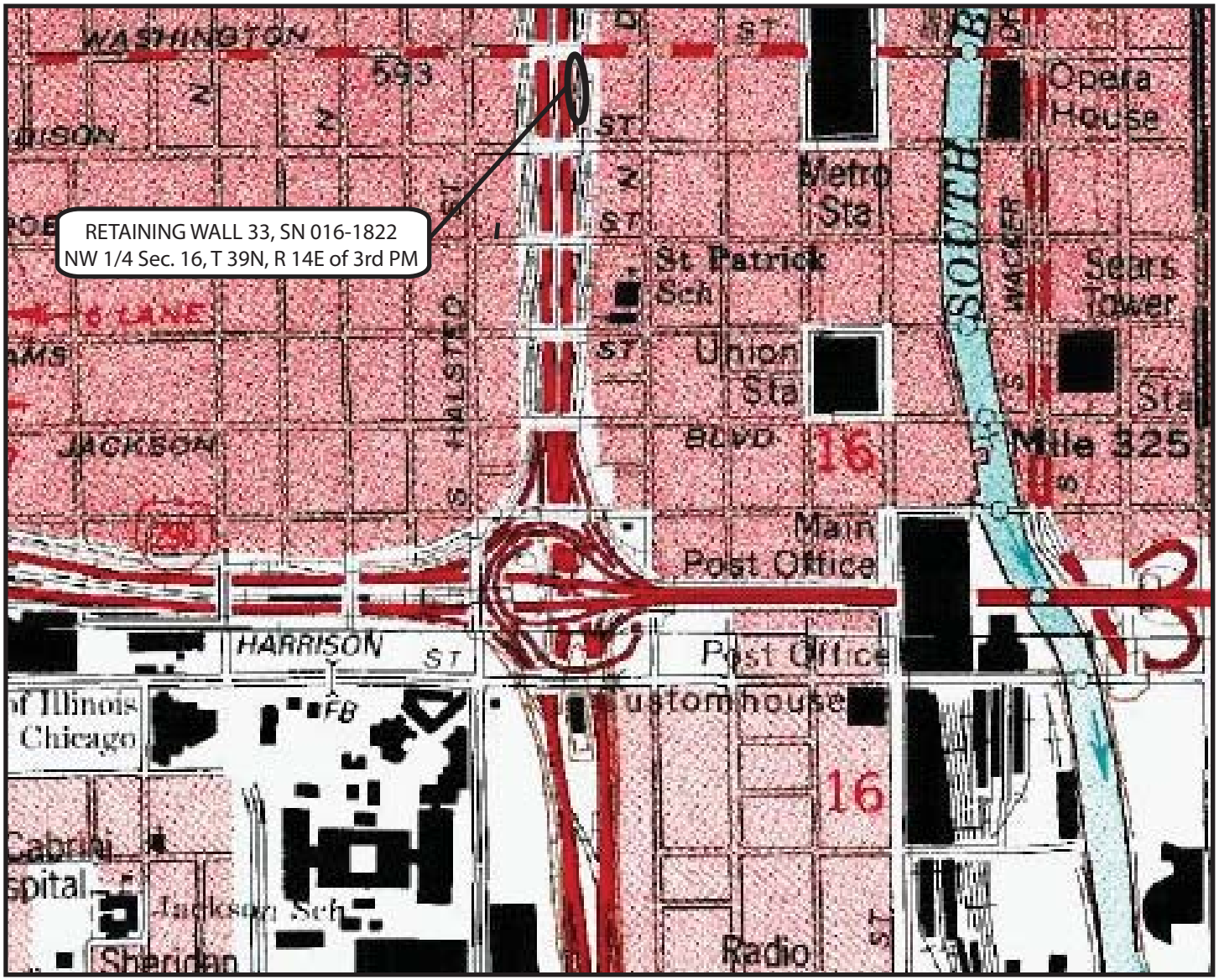
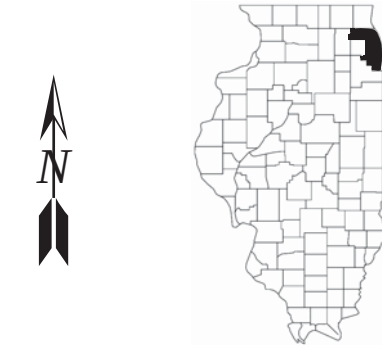
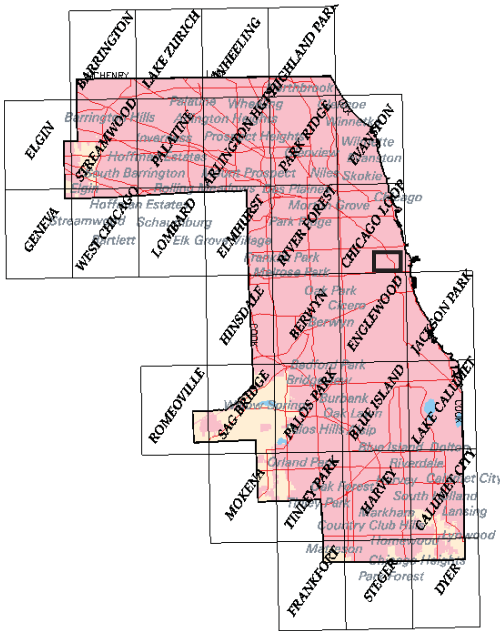
EXHIBITS







Cook County

0 0.25 0.5 Mile

SITE LOCATION MAP: CIRCLE INTERCHANGE RECONSTRUCTION
RETAINING WALL 33, SN 016-1822, COOK COUNTY

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: NSB CHECKED BY: MWS

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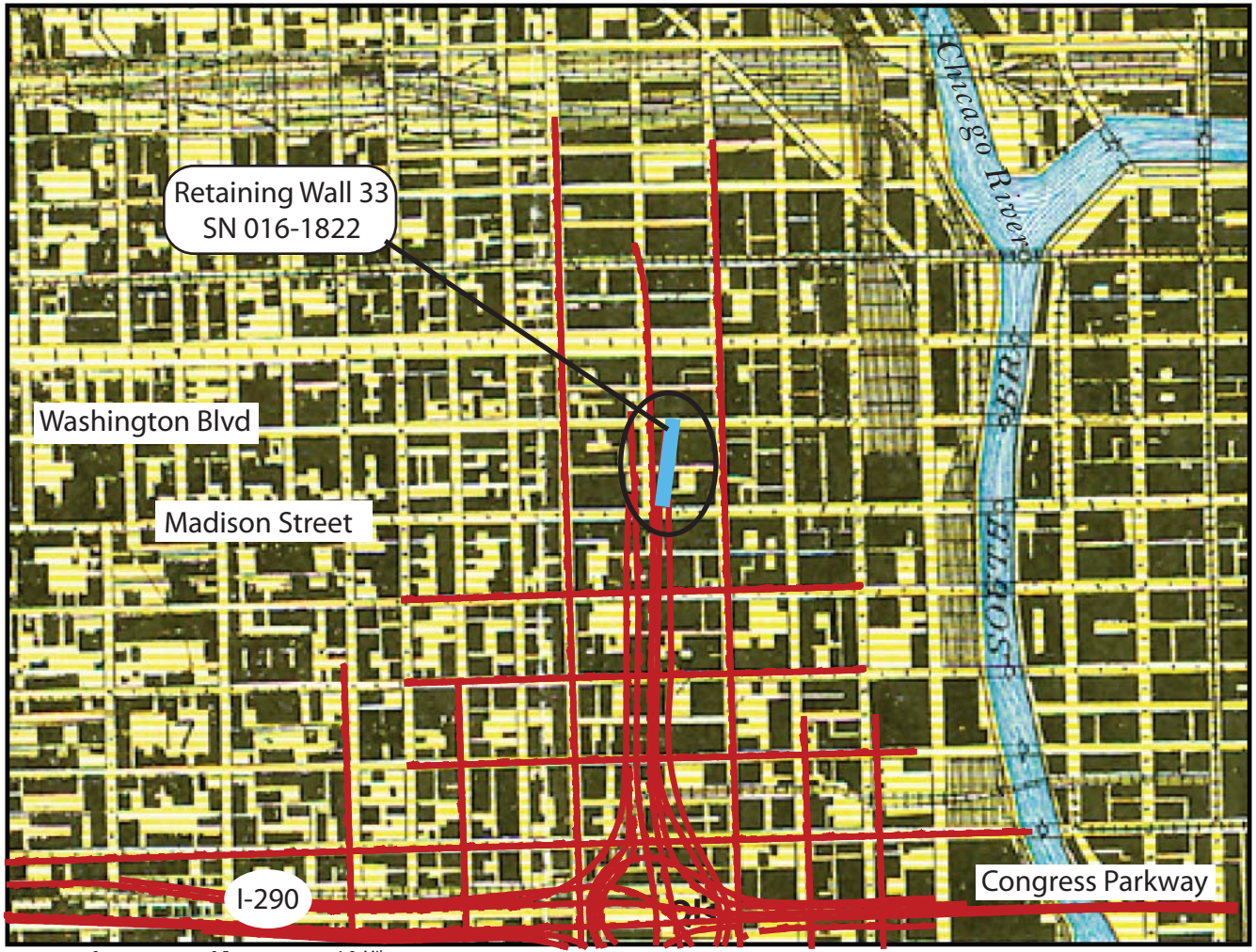

Modified after Bretz (1926)

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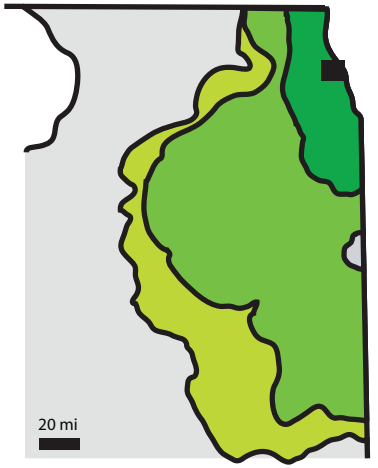
REGIONAL GEOLOGY



Wedron Group

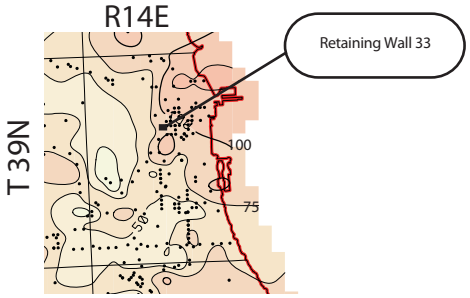
- Wadsworth Formation
- Lemont Formation
- Tiskilwa Formation

Modified after Hansel and Johnson (1996)

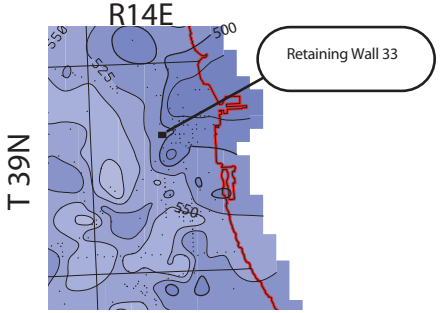
Legend

Qls — Glacial lake bottom
(Covered by lacustrine deposits)

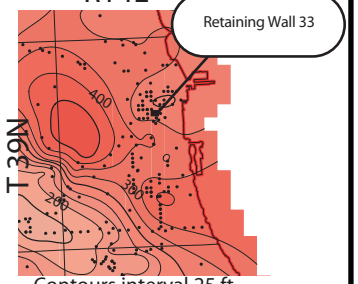
DRIFT THICKNESS



BEDROCK TOPOGRAPHY



BEDROCK THICKNESS



Contours interval 25 ft
Modified after Leetaru et. al. (2004)

0 2 4 8 miles

SITE AND REGIONAL GEOLOGY: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 33, SN 016-1822, COOK COUTY, IL

SCALE: GRAPHIC AL	EXHIBIT 2	DRAWN BY: R. KC CHECKED BY : C. Marin

Wang Engineering
1145 N. Main Street
Lombard, IL 60148
www.wangeng.com

FOR AECOM	1100-04-01

Bench Mark: Set "X" on northwest corner of handhole along east edge of SB I-90/94 20 feet north of Madison Street. Elev. 596.13.

Existing Structure: Existing Retaining Wall 21. Constructed in 1957 under F.A.I. Route 90/94, Section 0202.6-IP. Cast-in-place concrete retaining wall on metal shell piles and spread footing that measures 180'-0" from Washington Boulevard SE Wingwall south to Madison Street. Maximum height from top of wall to bottom of footing measures 15'-9½". The south portion of the existing retaining wall is to be removed and replaced with an MSE wall. The top part of the north portion of the wall is to be removed and replaced with a concrete parapet and anchorage slab.

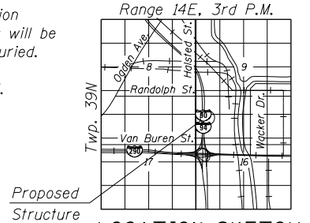
Traffic on NB Washington Exit Ramp will be detoured during construction.

No Salvage.

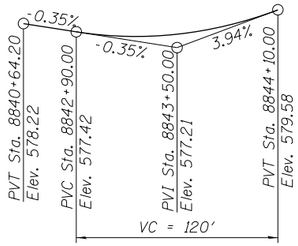
Notes:
1.) Wall offsets are measured from the ℄ of NB Washington Exit Ramp to the front face of the existing wall or precast panels.
2.) F.F. denotes Front Face.
3.) B.F. denotes Back Face.
4.) Repairs to front face of existing wall are to be made according to the Wall Condition Report.
5.) Stainless Steel Trellises to be installed on the front face of the wall. For limits, see Elevation View. For details, see Typical Cross Section and SS Cable Wall Mount Unit Detail on Sheet 2 of 2.
6.) Proposed drainage information shown is conceptual and will be determined during final design

SCOPE OF WORK:

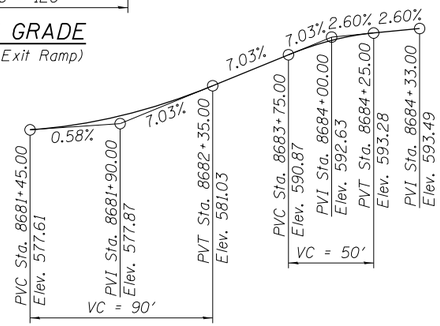
1.) Remove existing railing and wall to elevation specified in Elevation View. Existing piles will be cut to 1' below top of leveling pad and buried.
2.) Repair spalls, delaminated concrete, and cracks on the front face of existing wall.
3.) Construct MSE wall.
4.) Replace top portion of existing wall with parapet on top of anchorage slab.



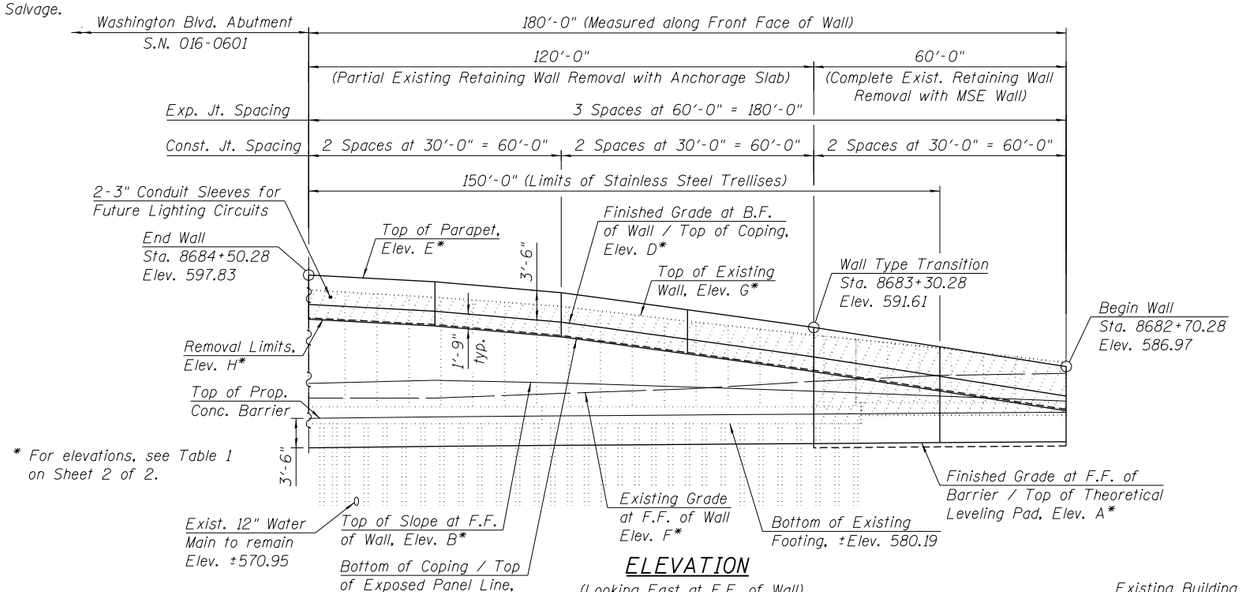
LOCATION SKETCH



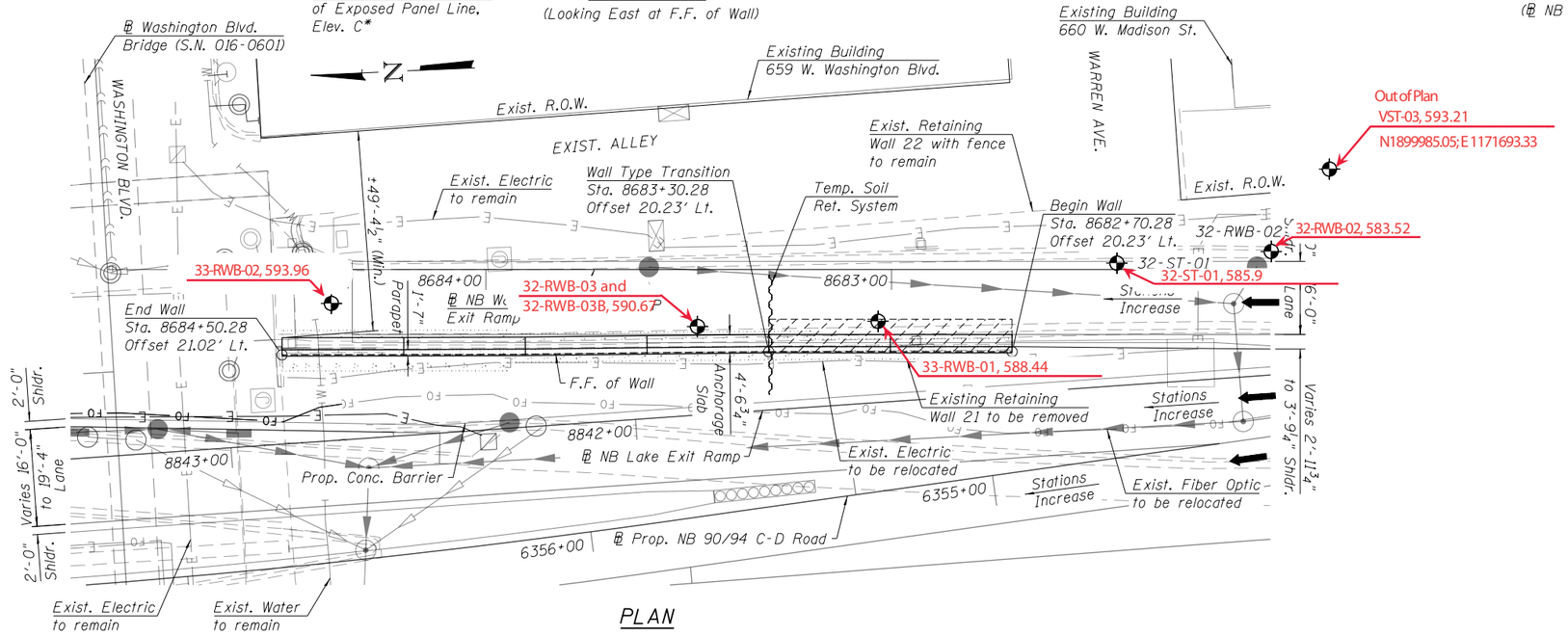
PROFILE GRADE
(℄ NB Lake Exit Ramp)



PROFILE GRADE
(℄ NB Washington Exit Ramp)



ELEVATION
(Looking East at F.F. of Wall)



PLAN

HIGHWAY CLASSIFICATION

NB Washington Exit Ramp
Functional Class: Interstate
ADT: 3,500 (2012); 4,000 (2040)
ADTT: 0 (2012); 0 (2040)
DHV: 430 (2040)
Design Speed: 30 m.p.h.
Posted Speed: 30 m.p.h.
One-Way Traffic
Directional Distribution: 100%

NB Lake Exit Ramp
Functional Class: Interstate
ADT: 8,200 (2012); 9,000 (2040)
ADTT: 312 (2012); 342 (2040)
DHV: 740 (2040)
Design Speed: 30 m.p.h.
Posted Speed: 30 m.p.h.
One-Way Traffic
Directional Distribution: 100%

DESIGN SPECIFICATIONS

2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition

2017 AASHTO LRFD Bridge Design Specifications 8th Edition

DESIGN STRESSES

FIELD UNITS
f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)

EXISTING UNITS
fc = 1,200 psi
fs = 20,000 psi (Reinforcement)

PRECAST UNITS
f'c = 4,500 psi

BORING LOCATION PLAN: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL33, F.A.I. RTE. 90/94, SN. 016-1822, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL | EXHIBIT 3 | DRAWN BY: RKC | CHECKED BY: N. Balakumaran

Wang Engineering
1145 N. Main Street
Lombard, IL 60148
www.wangeng.com

FOR AECOM | 1100-04-01

GENERAL PLAN
RETAINING WALL 33 ALONG NB WASHINGTON EXIT RAMP
F.A.I. RTE. 90/94 (KENNEDY EXPRESSWAY)
SECTION 2015-019R
COOK COUNTY
STATION 8682+70.28 TO STATION 8684+50.28
STRUCTURE NO. 016-1822

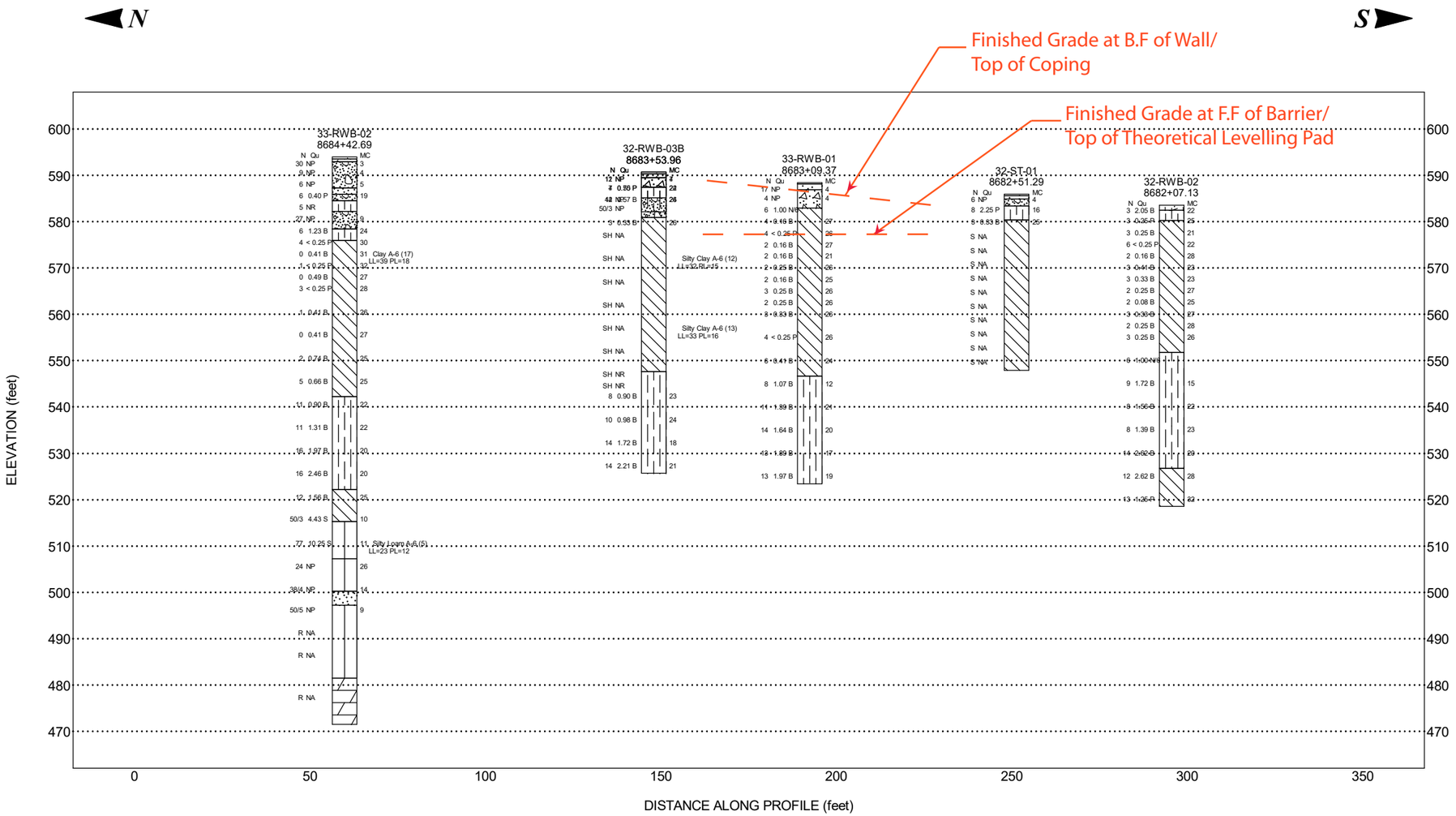
TranSystems

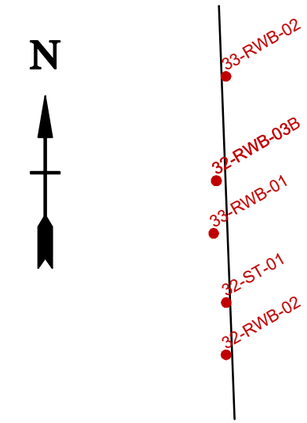
USER NAME = wjcolletti	DESIGNED - WJC	REVISED -
	CHECKED - MDS/JNP	REVISED -
PLOT SCALE = 36.0000 '/ in.	DRAWN - WJC	REVISED -
PLOT DATE = 4/4/2019	CHECKED - MDS/JNP	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 2 SHEETS

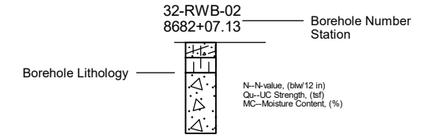
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94	2015-019R	COOK	2	1
		CONTRACT NO. 62A76		
	ILLINOIS FED. AID PROJECT			





Site Map Scale 1 inch equals 130 feet

Explanation:



Water Level Reading at time of drilling.

Water Level Reading 24-hr after drilling or at end of drilling

0 35

Horizontal Scale (feet)

Vertical Exaggeration: 1.5x

Lithology Graphics

- Pavement
- IDH Silty Clay, Silty Clay Loam
- IDH Clay
- Concrete
- Crushed stone
- Gravelly sand, sandy gravel
- IDH Sand, Sandy Loam
- IDH Silt, Silty Loam
- Dolomite or Dolomitic Limestone

Wang Engineering, Inc.
1145 North Main Street
Lombard, IL 60148

Soil Profile
Retaining Wall 33, SN 016-1822

WEI SINCE 1982

Jane Byrne Interchange
Section 17, T39N, R14E of 3rd PM

JOB NUMBER	PLATE NUMBER
1100-04-01	EXHIBIT 4

WEI 11X17 1100401.GPJ WANGENG.GDT 3/11/19

APPENDIX A

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1145 North Main Street
Lombard, IL 60148
Telephone: 630-953-9928
Fax: 630-953-9938

BORING LOG 32-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 583.52 ft
North: 1900472.26 ft
East: 1171630.21 ft
Station: 8682+07.13
Offset: 3.8668 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	582.5	12-inch thick ASPHALT --PAVEMENT--						
		Very stiff, brown and gray SILTY CLAY LOAM, trace gravel --FILL--			1	3 1 2	2.05 B	22
	580.3	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			2	2 2 1	0.25 P	25
			5		3	2 2 1	0.25 B	21
			10		4	2 3 3	< 0.25 P	22
					5	1 1 1	0.16 B	28
			15		6	1 1 2	0.41 B	23
					7	1 1 2	0.33 B	23
			20		8	1 1 1	0.25 B	27
			25		9	1 1 1	0.08 B	25
					10	1 1 2	0.33 B	27
					11	1 1 1	0.25 B	28
			30		12	0 1 2	0.25 B	26
	551.8	Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel						
			35		13	2 3 3	1.00 N/6	
			40		14	3 4 5	1.72 B	15

GENERAL NOTES

Begin Drilling: **06-26-2014** Complete Drilling: **06-26-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **N&K** Logger: **A. Happel** Checked by: **C. Marin**
Drilling Method: **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/11/19

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Fax: 630-953-9938

BORING LOG 32-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 583.52 ft
North: 1900472.26 ft
East: 1171630.21 ft
Station: 8682+07.13
Offset: 3.8668 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	526.8	Stiff to very stiff, gray CLAY, trace gravel	45		15	3 4 4	1.56 B	22
			50		16	4 3 5	1.39 B	23
			55		17	5 6 8	2.62 B	20
			60		18	5 6 6	2.62 B	28
	518.5	Boring terminated at 65.00 ft	65		19	5 6 7	1.25 P	32
			70					
			75					
			80					

GENERAL NOTES

Begin Drilling: **06-26-2014** Complete Drilling: **06-26-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **N&K** Logger: **A. Happel** Checked by: **C. Marin**
Drilling Method: **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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Fax: 630-953-9938

BORING LOG 32-RWB-03

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 590.67 ft
North: 1900619.59 ft
East: 1171621.95 ft
Station: 8683+53.96
Offset: 10.7621 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	590.3	4.5-inch thick ASPHALT --PAVEMENT--						
	589.5	9.5-inch thick CONCRETE --PAVEMENT--						
		Loose, brown and white CRUSHED STONE --BASE COURSE--			1	6 8 3	NP	7
	587.4	Medium stiff, brown SILTY CLAY, trace gravel and brick fragments --FILL--	5		2	3 3 4	0.50 P	22
					3	3 3 9	0.57 B	24
		--Obstruction at 8.5 feet--						
	582.2	Boring terminated at 8.50 ft	10					
			15					
			20					

GENERAL NOTES

Begin Drilling: **06-30-2014** Complete Drilling: **06-30-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **N&K** Logger: **D. Kolpacki** Checked by: **C. Marin**
Drilling Method: **2.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **DRY**
At Completion of Drilling: **DRY**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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Fax: 630-953-9938

BORING LOG 32-RWB-03B

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 590.67 ft
North: 1900619.59 ft
East: 1171621.95 ft
Station: 8683+53.96
Offset: 10.7621 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	590.4	4-inch thick ASPHALT --PAVEMENT--						
	589.5	10-inch thick CONCRETE --PAVEMENT--						
		Medium dense, light brown and white CRUSHED STONE --BASE COURSE--			1	7 7 5	NP	4
	587.4	Medium stiff, brown SILTY CLAY LOAM, little gravel and brick fragments --FILL--	5		2	2 2 2	0.75 P	24
	585.2	Dense to very dense, dark brown SANDY GRAVEL, some cinders and brick fragments --FILL--			3	14 7 37	NP	26
					4	50/3	NP	
	580.9	Very soft to soft, gray CLAY to SILTY CLAY, trace gravel	10		5	1 1 2	0.33 B	26
			15		1	PUSH	<0.25 P	26
		--L_L(%)=32, P_L(%)=15-- --%Gravel=2.3-- --%Sand=18.0-- --%Silt=49.2--	20		2	PUS	<0.25	31
		--%Clay=30.4-- --A-6 (12)--	25		3	PUSH	<0.25 P	26
			30		4	PUSH	<0.25 P	26
		--L_L(%)=33, P_L(%)=16-- --%Gravel=3.2-- --%Sand=13.8-- --%Silt=49.0-- --%Clay=34.0-- --A-6 (13)--	35		5	PUSH	<0.25 P	26
			40		6	PUS	<0.25	24

GENERAL NOTES

Begin Drilling: **07-01-2014** Complete Drilling: **07-01-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **N&K** Logger: **D. Kolpacki** Checked by: **C. Marin**
Drilling Method: **2.25" IDA HSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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Telephone: 630-953-9928
Fax: 630-953-9938

BORING LOG 32-RWB-03B

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 590.67 ft
North: 1900619.59 ft
East: 1171621.95 ft
Station: 8683+53.96
Offset: 10.7621 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	547.7	Medium stiff to very stiff, gray SILTY CLAY, trace gravel						
						H	P	
			45		7	PUSH	NR	
					8	PUSH	NR	
			50		6	3 3 5	0.90 B	23
			55		7	4 4 6	0.98 B	24
			60		8	4 7 7	1.72 B	18
	525.7	Boring terminated at 65.00 ft	65		9	7 5 9	2.21 B	21
			70					
			75					
			80					

GENERAL NOTES

Begin Drilling: **07-01-2014** Complete Drilling: **07-01-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **N&K** Logger: **D. Kolpacki** Checked by: **C. Marin**
Drilling Method: **2.25" IDA HSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 32-ST-01

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 585.90 ft
North: 1900516.46 ft
East: 1171630.30 ft
Station: 8682+51.29
Offset: 2.0492' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	585.6	4-inch thick, ASPHALT --PAVEMENT--						
	584.9	8-inch thick, CONCRETE --PAVEMENT--						
		Loose, gray GRAVELLY SAND --BASE COURSE--			1	4 4 2	NP	4
	583.4	Very stiff, brown and gray SILTY CLAY LOAM, trace gravel --FILL--			2	3 4 4	2.25 P	16
	580.4	Soft, gray CLAY to SILTY CLAY, trace gravel	5		3	1 1 2	0.33 B	25
		--UU test-- --Shear Strength(C_U)=288 psf--	10		1	PUSH	0.50 P	25
					2	PUSH	<0.25 P	26
		--UU test-- --Shear Strength(C_U)=576 psf--	15		3	PUSH	<0.25 P	24
			20		4	PUSH	<0.25 P	24
		--C_c = 0.212, OCR=1.03--	25		5	PUSH	<0.25 P	27
					6	PUSH	<0.25 P	26
		--UU test-- --Shear Strength(C_U)=576 psf--			7	PUSH	<0.25 P	25
			30		8	PUSH	<0.25 P	24
		--UU test-- --Shear Strength(C_U)=720 psf--			9	PUSH	0.50 P	24
			35		10	PUSH	0.75 P	25
	547.9	Boring terminated at 38.00 ft	40					

GENERAL NOTES

Begin Drilling: **10-20-2014** Complete Drilling: **10-20-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **P&P** Logger: **F. Bozga** Checked by: **GLM (-coord, lab)**
Drilling Method: **3.25" IDA HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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Telephone: 630-953-9928
Fax: 630-953-9938

BORING LOG 33-RWB-01

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 588.44 ft
North: 1900575.06 ft
East: 1171619.65 ft
Station: 8683+09.37
Offset: 11.1322 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	588.1	4-inch thick ASPHALT --PAVEMENT--						
	586.9	14-inch thick CONCRETE --PAVEMENT--						
		Loose to medium dense, brown and white CRUSHED STONE --BASE COURSE--			1	10 9 8	NP	4
			5		2	4 2 2	NP	4
	582.9	Very soft to soft, gray CLAY to SILTY CLAY, trace gravel			3	2 3 3	1.00 N/6	
			10		4	1 2 2	0.16 B	27
					5	4 3 1	< 0.25 P	26
			15		6	1 1 1	0.16 B	27
					7	1 1 1	0.16 B	21
			20		8	1 1 1	0.25 B	26
			25		9	1 1 1	0.16 B	25
					10	1 1 2	0.25 B	26
					11	1 1 1	0.25 B	26
			30		12	1 1 2	0.33 B	26
			35		13	1 2 2	< 0.25 P	26
			40		14	2 3 3	0.41 B	24

GENERAL NOTES

Begin Drilling: **06-29-2014** Complete Drilling: **06-29-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **N&K** Logger: **D. Kolpacki** Checked by: **C. Marin**
Drilling Method: **2.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/11/19

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wangeng@wangeng.com
1145 North Main Street
Lombard, IL 60148
Telephone: 630-953-9928
Fax: 630-953-9938

BORING LOG 33-RWB-01

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 588.44 ft
North: 1900575.06 ft
East: 1171619.65 ft
Station: 8683+09.37
Offset: 11.1322 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	546.7	Stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace gravel						
			45		15	3 4 4	1.07 B	12
			50		16	3 5 6	1.39 B	21
			55		17	5 7 7	1.64 B	20
			60		18	3 5 8	1.89 B	17
	523.4	Boring terminated at 65.00 ft	65		19	4 6 7	1.97 B	19
			70					
			75					
			80					

GENERAL NOTES

Begin Drilling: **06-29-2014** Complete Drilling: **06-29-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **N&K** Logger: **D. Kolpacki** Checked by: **C. Marin**
Drilling Method: **2.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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wangeng@wangeng.com
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BORING LOG 33-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 593.96 ft
North: 1900708.05 ft
East: 1171630.08 ft
Station: 8684+42.69
Offset: 6.4626 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	593.5	5-inch thick ASPHALT --PAVEMENT--						
	593.0	7-inch thick CONCRETE --PAVEMENT--						
		Medium dense, grayish white SANDY GRAVEL --FILL--			1	7 13 17	NP	3
					2	8 5 4	NP	4
			5					
	587.3	Loose, brown, fine SAND, trace gravel --FILL--			3	3 3 3	NP	5
	586.0	Grayish white SANDY GRAVEL --FILL--			4	3 3 3	0.40 P	19
	584.5	Soft, brown SILTY CLAY LOAM, trace gravel --FILL--	10					
	582.2	Medium dense, grayish white SANDY GRAVEL --FILL--			5	3 2 3	NR	
					6	8 11 16	NP	9
			15					
	578.5	Stiff, brown and gray SILTY CLAY LOAM to SILTY CLAY, trace gravel			7	1 2 4	1.23 B	24
	576.0	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			8	1 2 2	< 0.25 P	30
			20					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		L_L(%)=39, P_L(%)=18-- --%Gravel=5.1-- --%Sand=13.2-- --%Silt=42.2-- --%Clay=39.5-- --A-6 (17)--			9	0 0 0	0.41 B	31
					10	0 0 1	< 0.25 P	32
			25					
					11	0 0 0	0.49 B	27
					12	0 1 2	< 0.25 P	28
			30					
					13	0 0 1	0.41 B	26
			35					
					14	0 0 0	0.41 B	27
			40					

GENERAL NOTES

Begin Drilling: **07-01-2014** Complete Drilling: **07-02-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **R&J** Logger: **S. Woods** Checked by: **CLM (-data)**
Drilling Method: **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 33-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 593.96 ft
North: 1900708.05 ft
East: 1171630.08 ft
Station: 8684+42.69
Offset: 6.4626 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	0 0 2	0.74 B	25
			50		16	0 1 4	0.66 B	25
	542.2	Medium stiff to very stiff, gray SILTY CLAY, trace gravel	55		17	2 7 4	0.90 B	22
			60		18	1 5 6	1.31 B	22
	522.2	Stiff, gray CLAY to SILTY CLAY, trace gravel	65		19	3 7 9	1.97 B	20
			70		20	3 7 9	2.46 B	20
			75		21	2 5 7	1.56 B	25
	515.3	Hard, gray SILTY LOAM, trace gravel	--Dry-- 80		22	39 50/3	4.43 S	10

GENERAL NOTES

Begin Drilling: **07-01-2014** Complete Drilling: **07-02-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **R&J** Logger: **S. Woods** Checked by: **CLM (-data)**
Drilling Method: **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 33-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 593.96 ft
North: 1900708.05 ft
East: 1171630.08 ft
Station: 8684+42.69
Offset: 6.4626 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--L_L(%)=23, P_L(%)=12--						
		--%Gravel=6.9--						
		--%Sand=20.1--						
		--%Silt=57.0--						
		--%Clay=15.9--	85		23	24 37 40	10.25 S	11
		--A-6 (5)--						
	507.2	Medium dense, gray SILT						
		--Dry--						
			90		24	10 10 14	NP	26
	500.2	Very stiff, brown, fine SAND and SILT						
		--Dry--	95		25	22 44 38/4	NP	14
	497.2	Very dense, gray SILTY LOAM, trace gravel						
		--Dolostone fragments--	100		26	50/5	NP	9

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--HARD DRILLING--						
			105		1	C O R E		
			110		2	C O R E		
		--DIFFICULT DRILLING--						
	481.5	Strong, light gray, good rock mass quality, bedded fresh DOLOSTONE, up to 20-inch beds, 9-inch spaced joints, horizontal joints with none or less than <0.2-inch infilling, hard joint wall, with stylolitic surfaces, and moderately vuggy porosity.	115		3	C O R E		
		Run 1 - RECOVERY = 100% RQD = 86%						
			120					

GENERAL NOTES

Begin Drilling: **07-01-2014** Complete Drilling: **07-02-2014**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **R&J** Logger: **S. Woods** Checked by: **CLM (-data)**
Drilling Method: **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 33-RWB-02

WEI Job No.: 1100-04-01

Client **AECOM**
Project **Jane Byrne Interchange**
Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 593.96 ft
North: 1900708.05 ft
East: 1171630.08 ft
Station: 8684+42.69
Offset: 6.4626 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--drilling water loss--						
	471.5	Boring terminated at 122.50 ft						
			125					
			130					
			135					
			140					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)

GENERAL NOTES

Begin Drilling **07-01-2014** Complete Drilling **07-02-2014**
Drilling Contractor **Wang Testing Services** Drill Rig
Driller **R&J** Logger **S. Woods** Checked by **CLM (-data)**
Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **Rotary wash**
At Completion of Drilling ▼ **mud in the borehole**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

0 3 6 9 12 inch

Boring 33-RWB-02:
Run #1, 112.5' to 122.5', RECOVERY = 100% , RQD = 86%

BEDROCK CORE: CIRCLE INTERCHANGE RECONSTRUCTION CHICAGO. IL		
SCALE : GRAPHIC	33-RWB-02	DRAWN BY: A. HAPPEL CHECKED BY: C. Marin
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR AECOM		1100-04-01

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BORING LOG VST-03

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 593.21 ft
North: 1899985.05 ft
East: 1171693.33 ft
Station: 8415+53.90
Offset: 182.276 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	592.9	ASPHALT						
		--PAVEMENT--						
		Medium dense, brown gravelly coarse SAND						
		--FILL--						
			5		1	5 7 7	NP	6
	586.5							
		Medium stiff, brown and gray SILTY CLAY LOAM						
			10		2	3 2 2	0.75 P	26
	580.2							
		Soft, gray SILTY CLAY						
			15		3	3 2 2	NR	
					4	1 1 1	0.25 P	23
	575.0							
		--In-Situ Vane Shear, 19.5 feet--	20		1			

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--$S_{u\ undis}$ = 425.9 psf-- --$S_{u\ remold}$ = 371.3 psf-- --Sensitivity = 1.1--				VS		
		--In-Situ Vane Shear, 22.0 feet--			2	VS		
		--$S_{u\ undis}$ = 371.3 psf-- --$S_{u\ remold}$ = 305.8 psf-- --Sensitivity = 1.2--						
		--In-Situ Vane Shear, 24.5 feet--	25		3	VS		
		--$S_{u\ undis}$ = 382.2 psf-- --$S_{u\ remold}$ = 316.7 psf-- --Sensitivity = 1.2--						
		--In-Situ Vane Shear, 27.0 feet--			4	VS		
		--$S_{u\ undis}$ = 393.1 psf-- --$S_{u\ remold}$ = 338.5 psf-- --Sensitivity = 1.2--						
		--In-Situ Vane Shear, 29.5 feet--	30		5	VS		
		--$S_{u\ undis}$ = 622.5 psf-- --$S_{u\ remold}$ = 371.3 psf-- --Sensitivity = 1.7--						
		--In-Situ Vane Shear, 32.0 feet--			6	VS		
		--$S_{u\ undis}$ = 535.1 psf-- --$S_{u\ remold}$ = 327.6 psf-- --Sensitivity = 1.6--						
		--In-Situ Vane Shear, 34.5 feet--	35		7	VS		
		--$S_{u\ undis}$ = 535.1 psf-- --$S_{u\ remold}$ = 393.1 psf-- --Sensitivity = 1.4--						
		--In-Situ Vane Shear, 37.0 feet--			8	VS		
		--$S_{u\ undis}$ = 655.2 psf-- --$S_{u\ remold}$ = 404.1 psf-- --Sensitivity = 1.6--						
		--In-Situ Vane Shear, 39.5 feet--	40		9			

GENERAL NOTES

Begin Drilling: **12-02-2015** Complete Drilling: **12-02-2015**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **R&N** Logger: **F. Bozga** Checked by: **A. Kurnia**
Drilling Method: **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG VST-03

WEI Job No.: 1100-04-01

Client: **AECOM**
Project: **Jane Byrne Interchange**
Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
Elevation: 593.21 ft
North: 1899985.05 ft
East: 1171693.33 ft
Station: 8415+53.90
Offset: 182.276 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--$S_{u\ undis}$ = 622.5 psf--				VS		
		--$S_{u\ remold}$ = 382.2 psf--						
		--Sensitivity = 1.6--						
		--In-Situ Vane Shear, 42.0 feet--			10	VS		
		--$S_{u\ undis}$ = 851.8 psf--						
		--$S_{u\ remold}$ = 458.7 psf--						
		--Sensitivity = 1.9--						
		--In-Situ Vane Shear, 44.5 feet--	45		11	VS		
		--$S_{u\ undis}$ = 928.3 psf--						
		--$S_{u\ remold}$ = 600.6 psf--						
		--Sensitivity = 1.5--						
		--In-Situ Vane Shear, 47.0 feet--			12	VS		
		--$S_{u\ undis}$ = 1266.8 psf--						
		--$S_{u\ remold}$ = 633.4 psf--						
		--Sensitivity = 2.0--						
			50					
	541.7	--In-Situ Vane Shear, 51.0 feet--			13	VS		
		--$S_{u\ undis}$ = 1681.8 psf--						
		--$S_{u\ remold}$ = 1266.8 psf--						
		--Sensitivity = 1.3--						
		Boring terminated at 51.50 ft						
			55					
			60					

GENERAL NOTES

Begin Drilling: **12-02-2015** Complete Drilling: **12-02-2015**
Drilling Contractor: **Wang Testing Services** Drill Rig:
Driller: **R&N** Logger: **F. Bozga** Checked by: **A. Kurnia**
Drilling Method: **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **Rotary wash**
At Completion of Drilling: **mud in the borehole**
Time After Drilling: **NA**
Depth to Water: **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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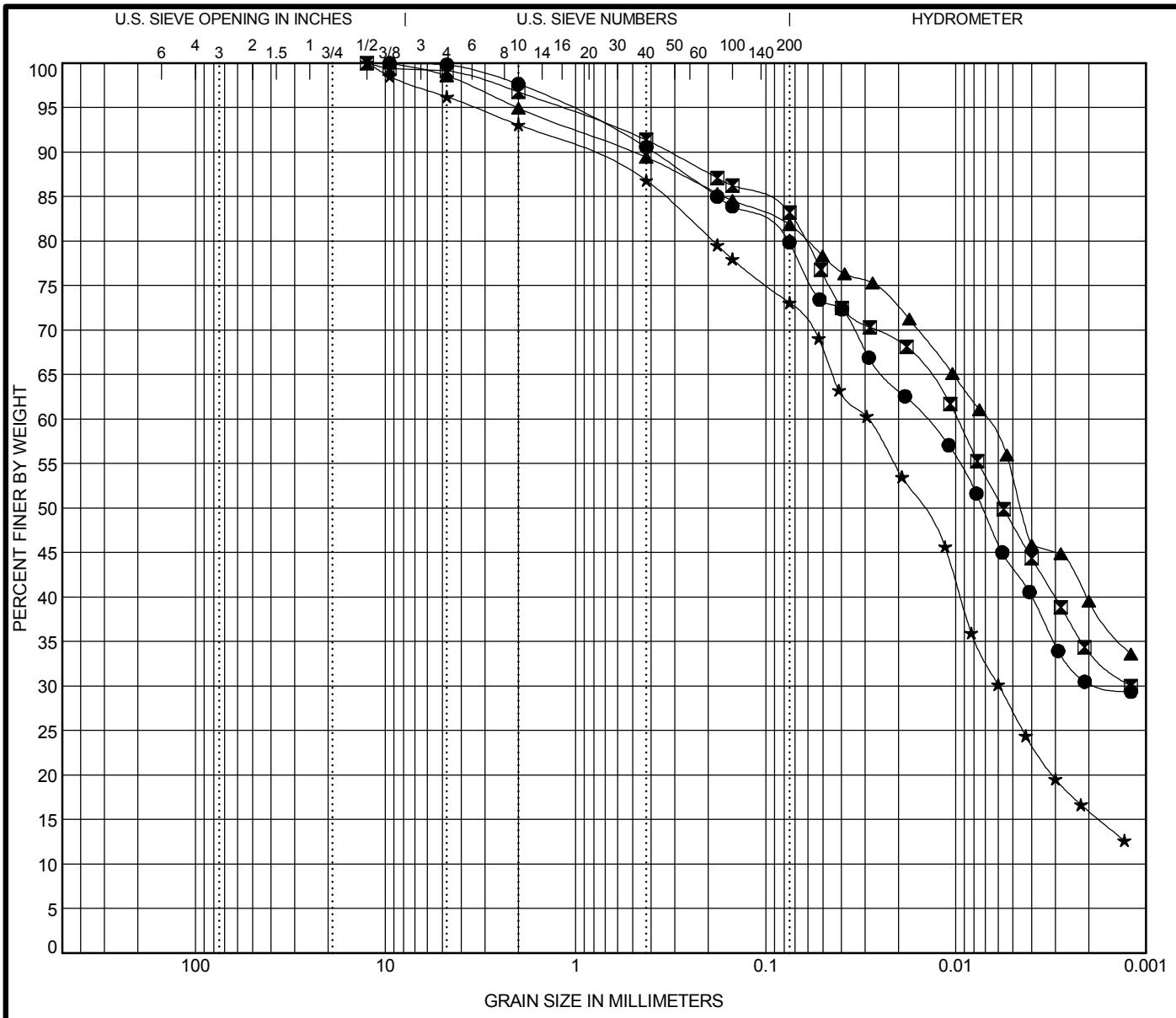
APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	32-RWB-03B#2	18.5 ft	**Silty Clay**	**32**	**15**	**17**		
⊠	32-RWB-03B#5	33.5 ft	**Silty Clay**	**33**	**16**	**17**		
▲	33-RWB-02#9	21.0 ft	**Clay**	**39**	**18**	**21**		
★	33-RWB-02#23	83.5 ft	**Silty Loam**	**23**	**12**	**11**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	32-RWB-03B#2	18.5 ft	**9.5**	**0.014**	**0.002**		**2.3**	**18.0**	**49.2**	**30.4**
⊠	32-RWB-03B#5	33.5 ft	**12.5**	**0.01**			**3.2**	**13.8**	**49.0**	**34.0**
▲	33-RWB-02#9	21.0 ft	**9.5**	**0.007**			**5.1**	**13.2**	**42.2**	**39.5**
★	33-RWB-02#23	83.5 ft	**12.5**	**0.029**	**0.006**		**6.9**	**20.1**	**57.0**	**15.9**

WEI SINCE 1982
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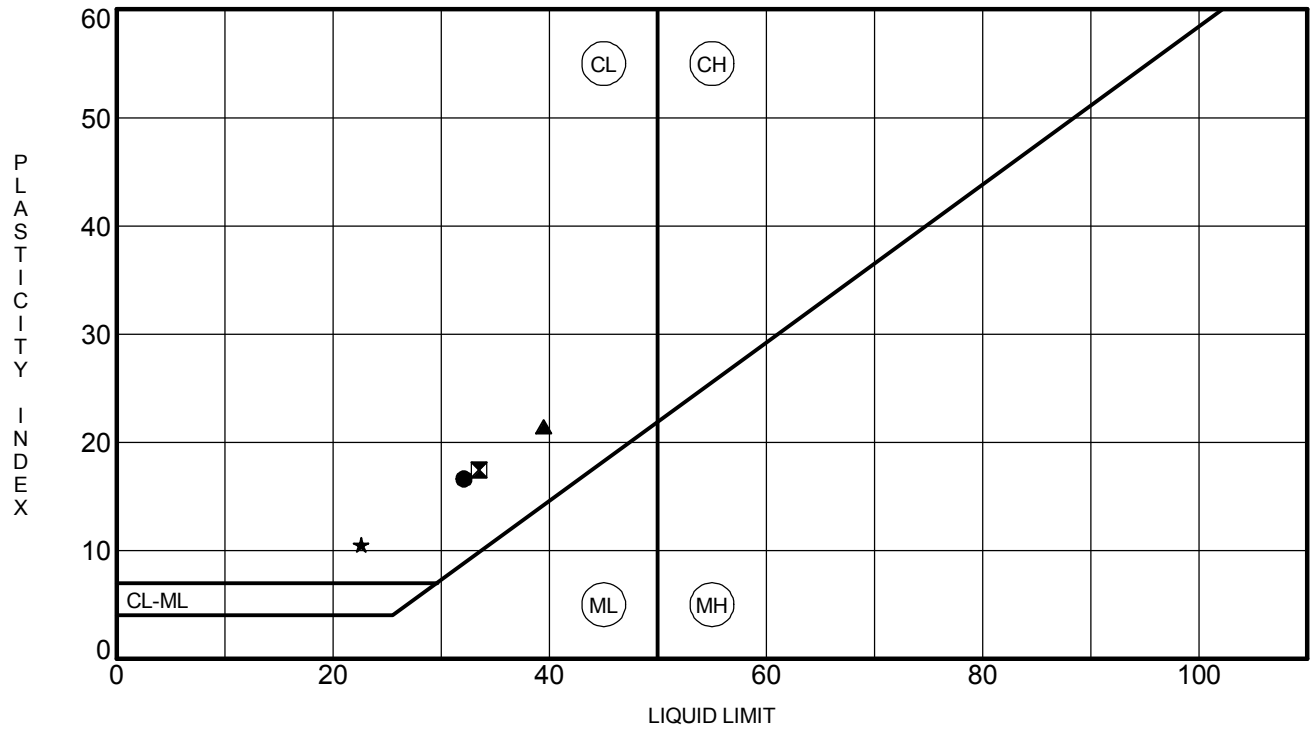
Fax: 630-953-9938

GRAIN SIZE DISTRIBUTION

Project: Jane Byrne Interchange

Location: Section 17, T39N, R14E of 3rd PM

Number: 1100-04-01



Specimen Identification			LL	PL	PI	Fines	IDH Classification
●	32-RWB-03B#2	18.5 ft	32	15	17	80	**Silty Clay**
⊠	32-RWB-03B#5	33.5 ft	33	16	17	83	**Silty Clay**
▲	33-RWB-02#9	21.0 ft	39	18	21	82	**Clay**
★	33-RWB-02#23	83.5 ft	23	12	11	73	**Silty Loam**

WEI SINCE 1982

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ATTERBERG LIMITS' RESULTS

Project: Jane Byrne Interchange

Location: Section 17, T39N, R14E of 3rd PM

Number: 1100-04-01

Wang Engineering

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ONE-DIMENSIONAL CONSOLIDATION TEST
AASHTO T 216 / ASTM D 2435

Project: Circle Interchange
Client: AECOM
Soil Sample ID: Boring 32-ST-01, ST#5, 21' to 23'
Sample Description: Gray CLAY with trace gravel (CL)

Tested by: M. Snider
Prepared by: M. Snider
Test date: 11/12/2014
WEI: 1100-04-01

Initial sample height =	1.004 in	Ring diameter =	2.495 in
Initial sample mass =	163.12 g	Ring mass =	109.98 g
Initial water content =	26.04%	Initial sample and ring mass =	273.10 g
Initial dry unit weight =	100.46 pcf	Tare mass =	78.78 g
Initial void ratio =	0.727	Final ring and sample mass =	264.82 g
Initial degree of saturation =	99.60%	Mass of wet sample and tare =	233.29 g
		Mass of dry sample and tare =	208.20 g
Final sample mass =	154.51 g	Initial dial reading =	0.01000 in
Final dry sample mass =	129.42 g	Final dial reading =	0.13864 in
Final water content =	19.39%	LL=	n.a. %
Final dry unit weight =	115.22 pcf	PL=	n.a. %
Final void ratio =	0.506	% Sand=	n.a. %
Final degree of saturation =	100.00%	% Silt=	n.a. %
Estimated specific gravity =	2.78	% Clay=	n.a. %
		In-Situ Vertical Effective Stress =	1800 psf

Compression and Swelling Indices

Compression index C_c =	0.177	**Preconsolidation pressure,s_C**	
Field corrected C_c =	0.212	Casagrande Method =	1845 psf
Swelling index C_s =	0.047	**Over-Consolidation Ratio (OCR) =**	1.03

Load number	Vertical stress	Dial reading	System deflection	Vertical strain	Void ratio	C_v	Cae	Elapsed time
	psf	in	in	%		ft^2/day	%	min
1	100.0	0.01281	0.00010	0.29	0.722	N/A	N/A	480
2	200.0	0.01671	0.00023	0.69	0.715	0.0614	0.06	1500
3	500.0	0.02694	0.00058	1.74	0.697	0.0675	0.14	3240
4	1000.0	0.03953	0.00090	3.03	0.674	0.0593	0.29	480
5	2000.0	0.06019	0.00135	5.13	0.638	0.0676	0.26	975
6	4000.0	0.08451	0.00193	7.61	0.595	0.0680	0.38	1740
7	8000.0	0.11304	0.00253	10.52	0.545	0.0948	0.39	1140
8	16000.0	0.14412	0.00324	13.68	0.491	0.1122	0.42	480
9	32000.0	0.17428	0.00413	16.77	0.437	0.1456	0.37	915
10	8000.0	0.17178	0.00295	16.41	0.443	N/A	N/A	480
11	2000.0	0.15710	0.00198	14.85	0.470	N/A	N/A	1335
11	500.0	0.14057	0.00123	13.13	0.500	N/A	N/A	3270

Prepared by: _____ Date: _____

Checked by: LL Date: 4/5/19

AASHTO R18

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Phone (630) 953-9928
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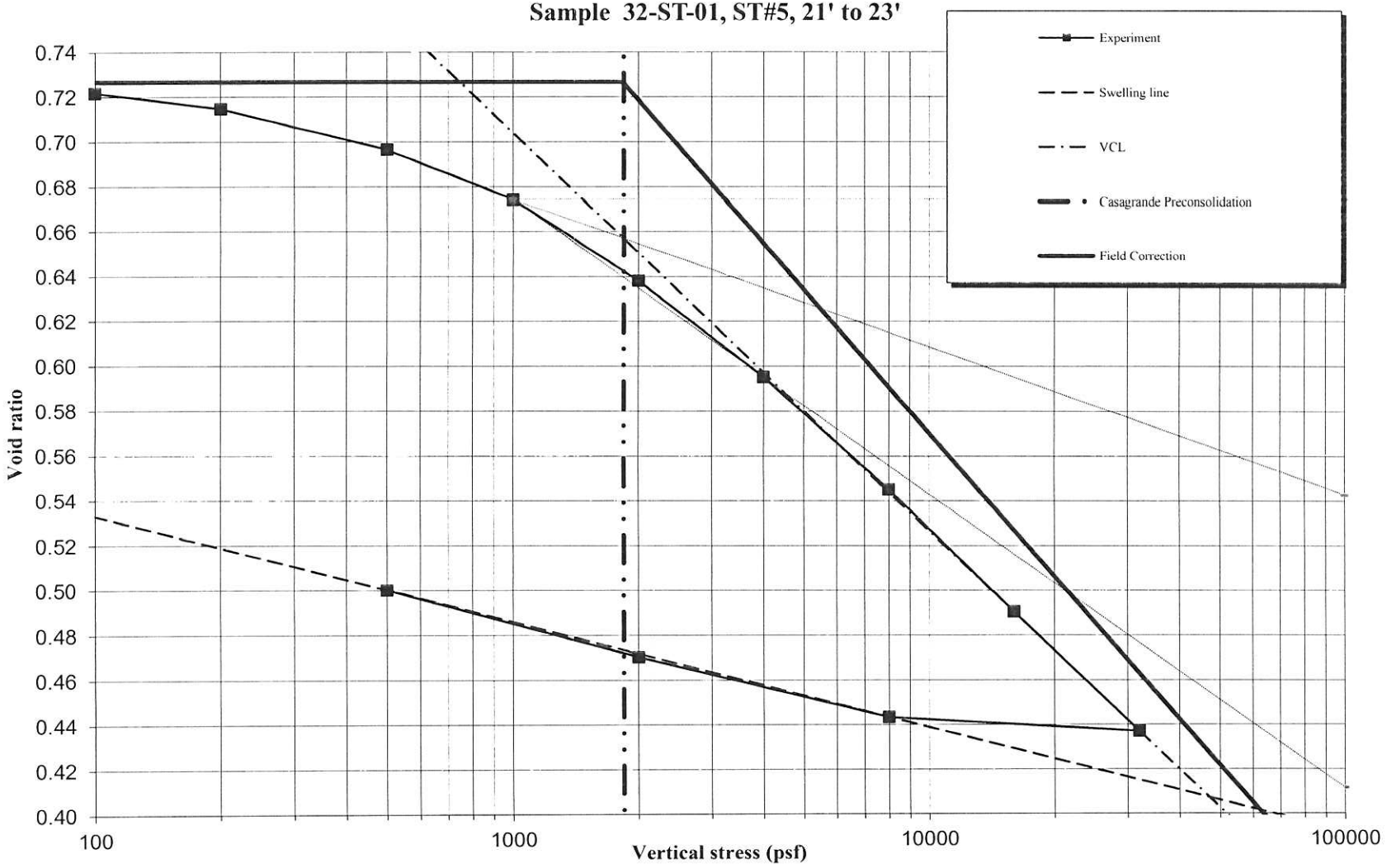
CONSOLIDATION CURVE

Sample 32-ST-01, ST#5, 21' to 23'



AASHTO R18

s:\netprojects\1870701\consolidation\ch12\lws_wang_mls_1870701_20to22feet_120910.xls

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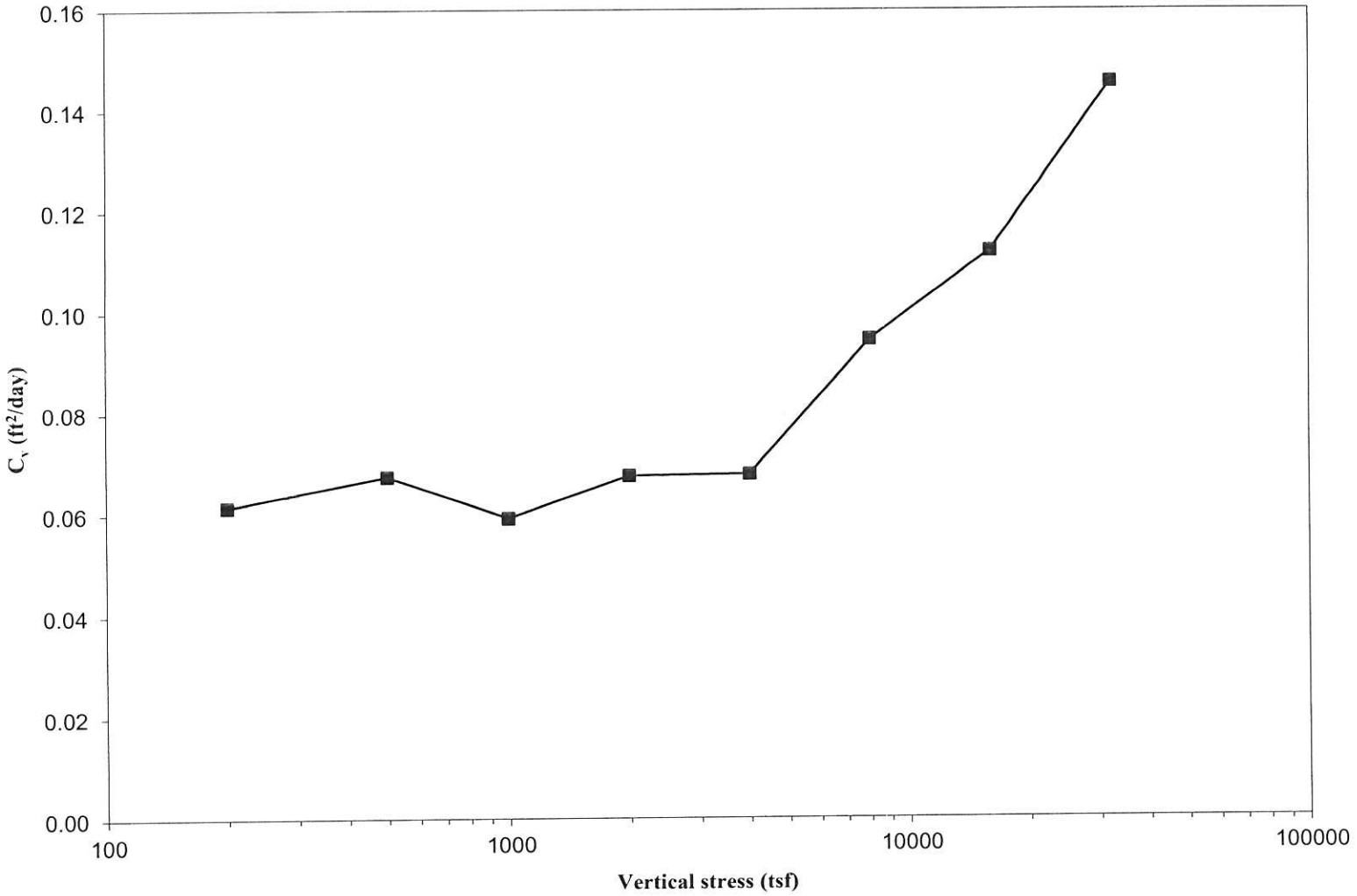
CONSOLIDATION COEFFICIENT (C_v) vs. VERTICAL STRESS

Sample 32-ST-01, ST#5, 21' to 23'



AASHTO R18

Wang Engineering

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

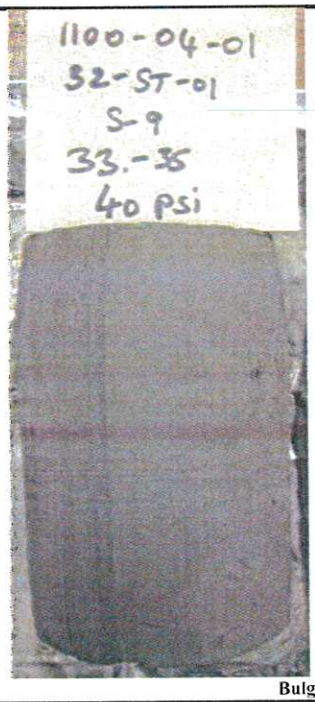
Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST#9 (33.0-35.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/12/2014
Sample description: Gray SILTY CLAY

Initial height h_0 =	5.78 in	Initial water content w =	23.77%
Initial diameter d_0 =	2.86 in	Initial unit weight γ_w =	128.93 pcf
Initial area A_0 =	6.41 in^2	Initial dry unit weight γ_d =	104.17 pcf
Mass of wet sample and tare M_t =	1269.25 g	Initial void ratio e_0 =	0.665
Mass of dry sample and tare M_d =	1028.20 g	Initial degree of saturation S_r =	99%
Mass of tare M_t =	14.15 g		
Mass of sample Ms=	1255.10 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	40.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.02		

Deviator stress at failure $D\sigma_f$ = 0.95 tsf
Major principal stress at failure σ_1 = 3.83 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	1.38	0.03	0.21
0.01	2.40	0.12	0.37
0.01	2.28	0.21	0.36
0.02	6.35	0.30	0.99
0.02	16.32	0.39	2.53
0.03	21.14	0.49	3.28
0.03	24.36	0.59	3.78
0.04	27.25	0.69	4.22
0.05	30.17	0.79	4.67
0.05	32.81	0.88	5.07
0.08	41.95	1.37	6.45
0.11	50.08	1.84	7.67
0.13	56.36	2.32	8.58
0.16	60.35	2.79	9.15
0.19	63.30	3.29	9.55
0.22	65.89	3.78	9.88
0.25	68.65	4.27	10.25
0.28	71.22	4.76	10.58
0.30	73.43	5.25	10.85
0.33	76.58	5.72	11.26
0.36	79.19	6.19	11.58
0.39	80.27	6.67	11.68
0.41	80.98	7.14	11.72
0.44	82.73	7.61	11.92
0.47	84.35	8.09	12.09
0.50	85.68	8.61	12.21
0.52	88.57	9.08	12.56
0.55	90.59	9.54	12.78
0.61	90.42	10.50	12.62
0.66	93.38	11.46	12.89
0.72	96.40	12.44	13.16
0.78	97.98	13.42	13.23
0.83	99.08	14.38	13.23



Bulge Failure

Prepared by: _____ Date: _____

Checked by: AL Date: 4/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST#9 (33.0-35.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/12/2014
Sample description: Gray SILTY CLAY

Initial height h_0 =	5.77 in	Initial water content w =	23.91%
Initial diameter d_0 =	2.83 in	Initial unit weight γ_w =	130.39 pcf
Initial area A_0 =	6.27 in^2	Initial dry unit weight γ_d =	105.23 pcf
Mass of wet sample and tare M_t =	1252.74 g	Initial void ratio e_0 =	0.649
Mass of dry sample and tare M_d =	1013.70 g	Initial degree of saturation S_r =	100%
Mass of tare M_t =	14.14 g		
Mass of sample Ms=	1238.60 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	20.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.04		

Deviator stress at failure $D\sigma_f$ = 0.90 tsf
Major principal stress at failure σ_1 = 2.34 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	0.91	0.05	0.14
0.01	0.65	0.14	0.10
0.01	4.34	0.23	0.69
0.02	13.28	0.32	2.11
0.02	16.83	0.42	2.67
0.03	18.72	0.52	2.97
0.04	20.29	0.62	3.22
0.04	21.84	0.72	3.46
0.05	23.26	0.81	3.68
0.05	24.78	0.90	3.92
0.08	31.85	1.39	5.01
0.11	37.28	1.86	5.83
0.13	42.26	2.33	6.58
0.16	46.64	2.80	7.23
0.19	50.69	3.29	7.82
0.22	53.67	3.78	8.23
0.25	56.66	4.28	8.65
0.28	59.97	4.78	9.10
0.30	62.45	5.28	9.43
0.33	65.14	5.76	9.79
0.36	67.90	6.24	10.15
0.39	69.98	6.73	10.41
0.42	71.25	7.22	10.54
0.44	73.07	7.69	10.75
0.47	75.26	8.18	11.02
0.50	76.77	8.70	11.17
0.53	78.71	9.17	11.40
0.56	80.80	9.63	11.64
0.61	82.53	10.60	11.76
0.67	85.48	11.56	12.05
0.72	87.51	12.52	12.21
0.78	90.47	13.50	12.48
0.84	91.32	14.47	12.45

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Checked by: LL Date: 4/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 9 (33.0-35.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/11/2014
Sample description: Gray SILTY CLAY

Initial height h_0 =	5.69 in	Initial water content w =	24.78%
Initial diameter d_0 =	2.85 in	Initial unit weight γ_w =	128.11 pcf
Initial area A_0 =	6.39 in^2	Initial dry unit weight γ_d =	102.67 pcf
Mass of wet sample and tare M_t =	1235.66 g	Initial void ratio e_0 =	0.690
Mass of dry sample and tare M_d =	993.00 g	Initial degree of saturation S_r =	100%
Mass of tare M_t =	13.66 g		
Mass of sample Ms=	1222.00 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	10.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	1.99		

Deviator stress at failure $D\sigma_f$ = 0.64 tsf
Major principal stress at failure σ_1 = 1.36 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	8.82	0.08	1.38
0.01	12.28	0.17	1.92
0.01	14.80	0.26	2.31
0.02	17.03	0.35	2.65
0.03	19.17	0.45	2.99
0.03	21.32	0.55	3.32
0.04	23.50	0.65	3.65
0.04	25.66	0.74	3.99
0.05	28.07	0.84	4.35
0.05	30.09	0.93	4.66
0.08	38.03	1.43	5.87
0.11	44.49	1.91	6.83
0.14	48.80	2.39	7.45
0.16	51.49	2.87	7.82
0.19	52.03	3.37	7.87
0.22	53.73	3.87	8.08
0.25	55.59	4.37	8.32
0.28	56.63	4.87	8.43
0.30	58.17	5.36	8.61
0.33	59.53	5.83	8.77
0.36	60.09	6.30	8.81
0.39	59.07	6.78	8.61
0.41	59.03	7.26	8.57
0.44	60.59	7.74	8.75
0.47	60.62	8.23	8.70
0.50	61.12	8.76	8.73
0.52	62.47	9.23	8.87
0.55	61.85	9.70	8.74
0.61	60.64	10.68	8.47
0.66	61.48	11.65	8.50
0.72	62.59	12.63	8.56
0.77	60.06	13.62	8.12
0.83	60.11	14.59	8.03

Bulge Failure

Prepared by: _____ Date: _____

Checked by: AA Date: 4/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

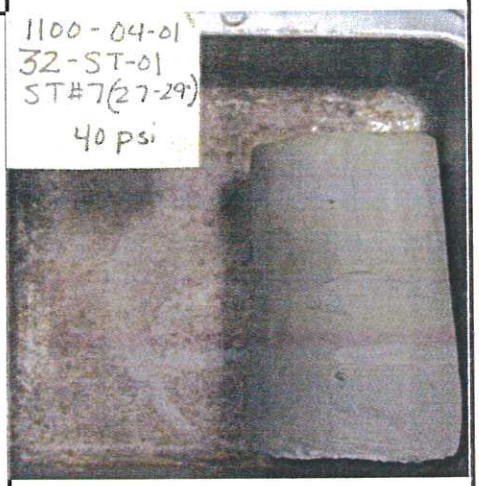
Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 7 (27.0-29.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/15/2014
Sample description: Gray SILTY CLAY

Initial height h_0 =	5.77 in	Initial water content w =	25.44%
Initial diameter d_0 =	2.85 in	Initial unit weight γ_w =	127.75 pcf
Initial area A_0 =	6.37 in^2	Initial dry unit weight γ_d =	101.84 pcf
Mass of wet sample and tare M_t =	1417.03 g	Initial void ratio e_0 =	0.703
Mass of dry sample and tare M_d =	1167.30 g	Initial degree of saturation S_r =	100%
Mass of tare M_t =	185.63 g		
Mass of sample Ms=	1231.40 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	40.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.03		

Deviator stress at failure $D\sigma_f$ = 0.55 tsf
Major principal stress at failure σ_1 = 3.43 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.01	5.20	0.09	0.82
0.01	10.58	0.19	1.66
0.02	13.08	0.28	2.05
0.02	14.62	0.38	2.29
0.03	15.83	0.48	2.47
0.03	16.95	0.59	2.65
0.04	17.98	0.68	2.80
0.04	19.01	0.78	2.96
0.05	20.04	0.88	3.12
0.06	20.96	0.98	3.26
0.08	25.01	1.47	3.87
0.11	28.37	1.95	4.37
0.14	32.51	2.43	4.98
0.17	34.45	2.91	5.25
0.20	36.22	3.39	5.49
0.22	38.20	3.87	5.77
0.25	40.07	4.37	6.02
0.28	41.37	4.85	6.18
0.31	43.29	5.33	6.44
0.33	45.50	5.79	6.73
0.36	46.02	6.25	6.77
0.39	46.29	6.72	6.78
0.41	47.50	7.19	6.92
0.44	48.78	7.68	7.07
0.47	48.77	8.16	7.03
0.50	50.72	8.68	7.27
0.53	52.28	9.15	7.46
0.56	52.09	9.62	7.39
0.61	52.32	10.59	7.35
0.67	53.21	11.59	7.39
0.72	56.12	12.55	7.71
0.78	54.97	13.51	7.47
0.83	56.46	14.47	7.58



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Prepared by: _____ Date: _____

Checked by: LL Date: 4/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 7 (27.0-29.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/15/2014
Sample description: Gray SILTY CLAY

Initial height h_0 =	5.76 in	Initial water content w =	25.10%
Initial diameter d_0 =	2.87 in	Initial unit weight γ_w =	126.60 pcf
Initial area A_0 =	6.46 in^2	Initial dry unit weight γ_d =	101.19 pcf
Mass of wet sample and tare M_t =	1423.57 g	Initial void ratio e_0 =	0.714
Mass of dry sample and tare M_d =	1175.50 g	Initial degree of saturation S_r =	98%
Mass of tare M_t =	187.37 g		
Mass of sample Ms=	1236.20 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	20.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.01		

Deviator stress at failure $D\sigma_f$ = 0.56 tsf
Major principal stress at failure σ_1 = 2.00 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	4.61	0.07	0.71
0.01	10.49	0.16	1.62
0.01	14.38	0.25	2.22
0.02	16.89	0.34	2.60
0.03	18.66	0.44	2.87
0.03	19.98	0.54	3.07
0.04	21.25	0.64	3.27
0.04	22.43	0.74	3.44
0.05	23.56	0.83	3.61
0.05	24.68	0.93	3.78
0.08	29.50	1.43	4.50
0.11	33.45	1.91	5.08
0.14	37.06	2.39	5.60
0.17	40.06	2.88	6.02
0.19	42.33	3.37	6.33
0.22	44.10	3.86	6.56
0.25	45.32	4.34	6.71
0.28	47.20	4.82	6.95
0.31	48.13	5.30	7.05
0.33	49.40	5.77	7.20
0.36	50.95	6.23	7.39
0.39	51.64	6.72	7.45
0.41	51.88	7.19	7.45
0.44	52.14	7.65	7.45
0.47	53.20	8.14	7.56
0.50	53.41	8.66	7.55
0.53	54.14	9.13	7.61
0.55	55.51	9.60	7.76
0.61	55.27	10.58	7.64
0.67	56.16	11.56	7.68
0.72	56.72	12.53	7.67
0.78	57.70	13.50	7.72
0.83	57.46	14.45	7.60

Bulge Failure

Prepared by: _____ Date: _____

Checked by: LL Date: 4/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

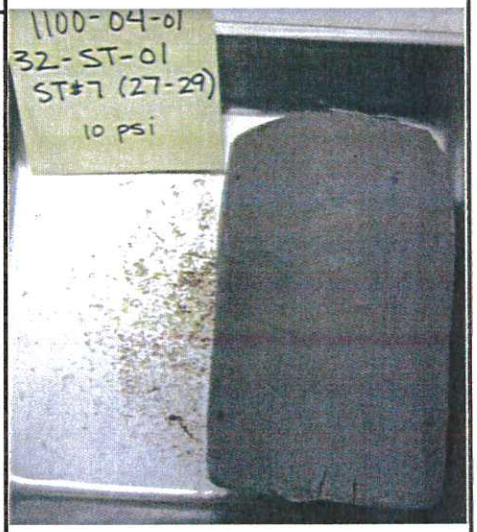
Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 7 (27.0-29.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/15/2014
Sample description: Gray SILTY CLAY

Initial height h_0 =	5.69 in	Initial water content w =	25.58%
Initial diameter d_0 =	2.85 in	Initial unit weight γ_w =	128.12 pcf
Initial area A_0 =	6.39 in^2	Initial dry unit weight γ_d =	102.02 pcf
Mass of wet sample and tare M_t =	1384.03 g	Initial void ratio e_0 =	0.700
Mass of dry sample and tare M_d =	1135.30 g	Initial degree of saturation S_r =	100%
Mass of tare M_t =	162.93 g		
Mass of sample Ms=	1221.10 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	10.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	1.99		

Deviator stress at failure $D\sigma_f$ = 0.50 tsf
Major principal stress at failure σ_1 = 1.22 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	6.34	0.04	0.99
0.01	12.01	0.13	1.88
0.01	13.50	0.23	2.11
0.02	14.59	0.32	2.28
0.02	15.67	0.41	2.44
0.03	16.62	0.51	2.59
0.04	17.47	0.62	2.72
0.04	18.52	0.72	2.88
0.05	19.63	0.82	3.05
0.05	20.79	0.92	3.23
0.08	23.56	1.42	3.64
0.11	27.19	1.91	4.18
0.14	30.67	2.40	4.69
0.16	32.78	2.89	4.99
0.19	34.01	3.38	5.15
0.22	35.96	3.86	5.41
0.25	37.47	4.37	5.61
0.28	38.83	4.86	5.79
0.30	40.07	5.35	5.94
0.33	42.25	5.83	6.23
0.36	43.14	6.30	6.33
0.39	43.57	6.78	6.36
0.41	45.12	7.25	6.55
0.44	44.97	7.74	6.50
0.47	45.70	8.22	6.57
0.50	46.39	8.76	6.63
0.53	47.71	9.23	6.78
0.55	48.22	9.71	6.82
0.61	49.24	10.67	6.89
0.66	49.31	11.67	6.82
0.72	50.76	12.67	6.94
0.78	51.32	13.64	6.94
0.83	51.26	14.62	6.85



Bulge Failure

Prepared by: _____ Date: _____

Checked by: AL Date: 4/5/17

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

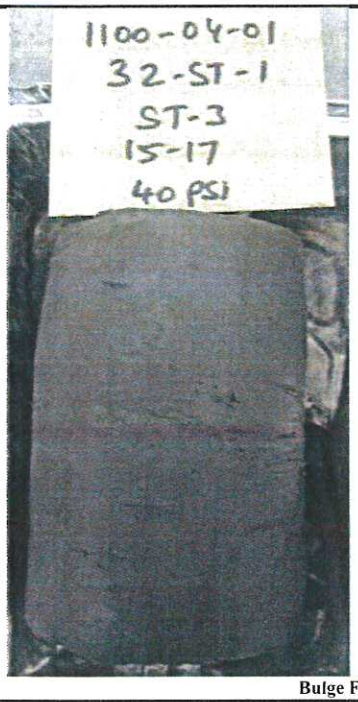
Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 3 (15.0-17.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/10/2014
Sample description: Gray CLAY

Initial height h_0 =	5.77 in	Initial water content w =	25.86%
Initial diameter d_0 =	2.85 in	Initial unit weight γ_w =	126.60 pcf
Initial area A_0 =	6.39 in^2	Initial dry unit weight γ_d =	100.59 pcf
Mass of wet sample and tare M_t =	1238.40 g	Initial void ratio e_0 =	0.725
Mass of dry sample and tare M_d =	986.70 g	Initial degree of saturation S_r =	99%
Mass of tare M_t =	13.30 g		
Mass of sample Ms=	1225.10 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	40.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.02		

Deviator stress at failure $D\sigma_f$ = 0.35 tsf
Major principal stress at failure σ_1 = 3.23 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.01	1.03	0.11	0.16
0.01	2.80	0.20	0.44
0.02	4.17	0.30	0.65
0.02	5.38	0.39	0.84
0.03	6.20	0.49	0.96
0.03	6.67	0.58	1.04
0.04	7.18	0.68	1.12
0.04	7.64	0.78	1.18
0.05	8.23	0.87	1.28
0.06	8.94	0.97	1.38
0.08	11.75	1.44	1.81
0.11	13.73	1.91	2.11
0.14	15.09	2.39	2.30
0.17	15.45	2.88	2.35
0.19	16.60	3.37	2.51
0.22	18.06	3.88	2.71
0.25	19.22	4.38	2.87
0.28	20.64	4.87	3.07
0.31	22.82	5.35	3.38
0.34	23.71	5.82	3.49
0.36	23.73	6.31	3.48
0.39	24.33	6.78	3.55
0.42	25.39	7.27	3.68
0.45	26.21	7.76	3.78
0.47	27.36	8.23	3.93
0.50	29.55	8.75	4.22
0.53	30.26	9.22	4.30
0.56	29.74	9.69	4.20
0.61	31.18	10.65	4.36
0.67	32.60	11.63	4.51
0.73	35.13	12.60	4.80
0.78	34.60	13.58	4.68
0.81	35.37	13.97	4.76



Bulge Failure

Prepared by: _____ Date: _____

Checked by: AL Date: 4/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

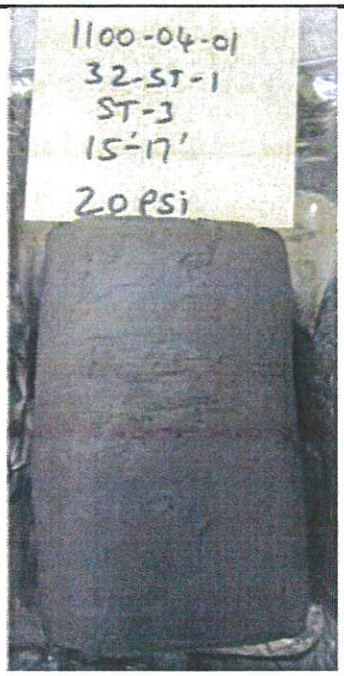
Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 3 (15.0-17.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/10/2014
Sample description: Gray CLAY

Initial height h_0 =	5.79 in	Initial water content w =	24.37%
Initial diameter d_0 =	2.83 in	Initial unit weight γ_w =	129.41 pcf
Initial area A_0 =	6.31 in^2	Initial dry unit weight γ_d =	104.05 pcf
Mass of wet sample and tare M_t =	1255.48 g	Initial void ratio e_0 =	0.667
Mass of dry sample and tare M_d =	1012.10 g	Initial degree of saturation S_r =	100%
Mass of tare M_t =	13.48 g		
Mass of sample Ms=	1242.00 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	20.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.04		

Deviator stress at failure $D\sigma_f$ = 0.52 tsf
Major principal stress at failure σ_1 = 1.96 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	4.10	0.07	0.65
0.01	6.12	0.16	0.97
0.01	7.61	0.25	1.20
0.02	8.62	0.34	1.36
0.03	9.42	0.44	1.49
0.03	10.13	0.54	1.60
0.04	10.84	0.64	1.71
0.04	11.55	0.74	1.82
0.05	12.20	0.83	1.92
0.05	12.85	0.93	2.02
0.08	15.77	1.41	2.46
0.11	18.33	1.86	2.85
0.14	20.96	2.33	3.24
0.16	23.17	2.80	3.57
0.19	24.83	3.28	3.81
0.22	26.87	3.76	4.10
0.25	28.91	4.27	4.39
0.28	30.79	4.76	4.65
0.30	32.71	5.26	4.91
0.33	34.86	5.74	5.21
0.36	36.10	6.22	5.36
0.39	37.43	6.70	5.53
0.42	38.92	7.17	5.73
0.44	40.36	7.67	5.90
0.47	41.72	8.15	6.07
0.50	43.26	8.67	6.26
0.53	45.14	9.14	6.50
0.56	45.85	9.60	6.57
0.61	47.59	10.54	6.75
0.67	49.67	11.52	6.96
0.72	52.12	12.47	7.23
0.78	52.97	13.43	7.27



Bulge Failure

Prepared by: _____ Date: _____

Checked by: AL Date: 4/15/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 3 (15.0-17.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/10/2014
Sample description: Gray CLAY

Initial height h_0 =	5.84 in	Initial water content w =	24.98%
Initial diameter d_0 =	2.87 in	Initial unit weight γ_w =	125.23 pcf
Initial area A_0 =	6.48 in^2	Initial dry unit weight γ_d =	100.20 pcf
Mass of wet sample and tare M_t =	1257.66 g	Initial void ratio e_0 =	0.731
Mass of dry sample and tare M_d =	1009.10 g	Initial degree of saturation S_r =	95%
Mass of tare M_t =	14.16 g		
Mass of sample Ms=	1243.50 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	10.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.03		

Deviator stress at failure $D\sigma_f$ = 0.60 tsf
Major principal stress at failure σ_1 = 1.32 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	3.93	0.05	0.61
0.01	5.97	0.14	0.92
0.01	6.70	0.23	1.03
0.02	7.37	0.33	1.13
0.02	8.11	0.42	1.25
0.03	8.65	0.51	1.33
0.04	9.18	0.61	1.41
0.04	9.88	0.71	1.51
0.05	11.05	0.81	1.69
0.05	12.07	0.90	1.85
0.08	15.00	1.38	2.28
0.11	18.60	1.85	2.82
0.14	21.34	2.32	3.22
0.16	23.82	2.79	3.57
0.19	25.57	3.28	3.82
0.22	27.58	3.77	4.10
0.25	30.11	4.26	4.45
0.28	32.26	4.76	4.74
0.31	34.87	5.24	5.10
0.33	37.53	5.71	5.46
0.36	39.66	6.18	5.74
0.39	40.78	6.65	5.87
0.42	42.04	7.12	6.02
0.44	44.31	7.60	6.32
0.47	46.08	8.08	6.54
0.50	48.45	8.59	6.83
0.53	50.95	9.05	7.15
0.56	52.53	9.52	7.33
0.61	53.64	10.47	7.41
0.67	57.16	11.43	7.81
0.72	61.27	12.39	8.28
0.78	62.45	13.37	8.35

Bulge Failure

Prepared by: _____ Date: _____

Checked by: AL Date: 4/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 1 (9.0-11.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/10/2014
Sample description: Gray CLAY

Initial height h_0 =	5.79 in	Initial water content w =	25.10%
Initial diameter d_0 =	2.87 in	Initial unit weight γ_w =	124.88 pcf
Initial area A_0 =	6.45 in^2	Initial dry unit weight γ_d =	99.82 pcf
Mass of wet sample and tare M_t =	1236.99 g	Initial void ratio e_0 =	0.738
Mass of dry sample and tare M_d =	991.50 g	Initial degree of saturation S_r =	95%
Mass of tare M_t =	13.59 g		
Mass of sample Ms=	1223.40 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	30.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.02		

Deviator stress at failure $D\sigma_f$ = 0.43 tsf
Major principal stress at failure σ_1 = 2.59 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	1.65	0.00	0.26
0.01	4.14	0.09	0.64
0.01	6.09	0.19	0.94
0.02	7.27	0.28	1.12
0.02	8.26	0.37	1.28
0.03	9.03	0.47	1.39
0.03	9.72	0.56	1.50
0.04	10.33	0.66	1.59
0.04	10.90	0.76	1.68
0.05	11.45	0.85	1.76
0.08	14.20	1.33	2.17
0.10	16.68	1.80	2.54
0.13	19.34	2.27	2.93
0.16	21.32	2.74	3.22
0.19	22.62	3.23	3.39
0.22	24.19	3.72	3.61
0.24	26.10	4.22	3.88
0.27	27.91	4.72	4.12
0.30	29.64	5.21	4.36
0.33	31.30	5.69	4.58
0.36	32.68	6.16	4.75
0.38	33.01	6.65	4.78
0.41	33.78	7.12	4.86
0.44	35.08	7.60	5.03
0.47	36.19	8.09	5.16
0.50	37.59	8.61	5.33
0.53	38.94	9.07	5.49
0.55	40.36	9.54	5.66
0.61	40.07	10.49	5.56
0.66	41.80	11.45	5.74
0.72	43.90	12.41	5.96
0.77	44.35	13.39	5.96
0.83	45.41	14.37	6.03

Bulge Failure

Prepared by: _____ Date: _____

Checked by: MdL Date: 1/5/19

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UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

AASHTO T 296 / ASTM D 2850-95

Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-ST-01, ST# 1 (9.0-11.0ft)
Type/Condition: ST/Undisturbed

Analyst name: M. de los Reyes
Date received: 10/20/2014
Test date: 12/10/2014
Sample description: Gray CLAY

Initial height h_0 =	5.74 in	Initial water content w =	25.45%
Initial diameter d_0 =	2.85 in	Initial unit weight γ_w =	127.07 pcf
Initial area A_0 =	6.39 in^2	Initial dry unit weight γ_d =	101.29 pcf
Mass of wet sample and tare M_t =	1237.06 g	Initial void ratio e_0 =	0.713
Mass of dry sample and tare M_d =	988.80 g	Initial degree of saturation S_r =	99%
Mass of tare M_t =	13.26 g		
Mass of sample Ms=	1223.80 g	Liquid Limit (%):	NA
Estimated specific gravity G_s =	2.78	Plastic Limit (%):	NA
Cell confining pressure σ_3 =	15.0 psi	Sand(%):	NA
Rate of strain =	1 %/min	Silt(%):	NA
Proving Ring Factor =	1.000	Clay(%):	NA
Height to diameter ratio =	2.01		

Deviator stress at failure $D\sigma_f$ = 0.31 tsf
Major principal stress at failure σ_1 = 1.39 tsf

Axial Displacement (in) Δh	Axial Force (lbs) F	Axial Strain (%) e	Deviator Stress (psi) $\sigma_1-\sigma_3$
0.00	0.00	0.00	0.00
0.00	2.69	0.05	0.42
0.01	3.89	0.14	0.61
0.01	5.01	0.23	0.78
0.02	5.82	0.32	0.91
0.02	6.46	0.41	1.01
0.03	7.03	0.51	1.09
0.04	7.53	0.61	1.17
0.04	7.98	0.73	1.24
0.05	8.44	0.83	1.31
0.05	9.06	0.92	1.40
0.08	10.98	1.39	1.69
0.11	13.07	1.86	2.01
0.13	14.83	2.34	2.27
0.16	15.62	2.82	2.38
0.19	16.39	3.31	2.48
0.22	17.53	3.79	2.64
0.25	18.98	4.31	2.84
0.28	20.01	4.81	2.98
0.30	21.05	5.31	3.12
0.33	22.61	5.79	3.33
0.36	23.11	6.27	3.39
0.39	23.36	6.75	3.41
0.41	24.10	7.22	3.50
0.44	25.16	7.71	3.63
0.47	25.95	8.20	3.73
0.50	26.92	8.73	3.84
0.53	28.10	9.20	3.99
0.56	28.17	9.67	3.98
0.61	28.70	10.61	4.01
0.67	30.12	11.60	4.17
0.72	31.71	12.57	4.34
0.78	31.41	13.55	4.25
0.83	32.33	14.54	4.32

Bulge Failure

Prepared by: _____ Date: _____

Checked by: LL Date: 1/5/19

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UNCONFINED COMPRESSIVE STRENGTH of COHESIVE SOIL

(AASHTO T 208 / ASTM D 2166)

Project: Circle Interchange
Client: AECOM
WEI Job No.: 1100-04-01
Soil Sample ID: 32-RWB-03, ST#3 (23.5-25.0ft)
Type/Condition: ST/undisturbed
Liquid Limit (%): NA
Plastic Limit (%): NA

Analyst name: A. Mohammed
Date received: 7/1/2014
Test date: 10/6/2014
Sample description: Gray Silty Clay trace Gravel

Sand(%): NA
Silt(%): NA
Clay(%): NA

Average initial height h_0 =	5.99	in
Average initial diameter d_0 =	2.86	in
Height to diameter ratio=	2.10	
Mass of wet sample =	1289.90	g
Mass of dry sample and tare =	1048.80	g
Mass of tare =	13.49	g
Specific gravity =	2.76	(estimated)

Initial water content w =	24.59%	(specimen)
Initial unit weight g =	127.98	pcf
Initial dry unit weight g_d =	102.72	pcf
Initial void ratio e_0 =	0.68	
Initial degree of saturation S_r =	100%	
Average Rate of Strain=	1%/min	
Unconfined compressive strength q_u =	0.50	tsf
Shear Strength=	0.25	tsf

Displacement (in) Δh	Force (lbs) F	Strain (%) e	Stress (tsf) s
0.00	0.00	0.00	0.00
0.03	7.26	0.50	0.08
0.06	13.48	1.00	0.15
0.09	17.63	1.50	0.20
0.12	22.81	2.00	0.25
0.15	26.96	2.50	0.30
0.18	31.11	3.00	0.34
0.21	33.18	3.50	0.36
0.24	35.26	4.00	0.38
0.27	37.33	4.50	0.40
0.30	39.41	5.01	0.42
0.35	41.48	5.84	0.44
0.40	43.55	6.67	0.46
0.45	45.63	7.51	0.47
0.50	47.70	8.34	0.49
0.55	48.74	9.18	0.50
0.60	49.78	10.01	0.50
0.65	49.78	10.84	0.50
0.70	50.81	11.68	0.50
0.80	51.85	13.35	0.50
0.90	51.85	15.02	0.50

NOTES:

Prepared by: _____ Date: _____

Checked by: AL Date: 7/5/14

AASHTO R18

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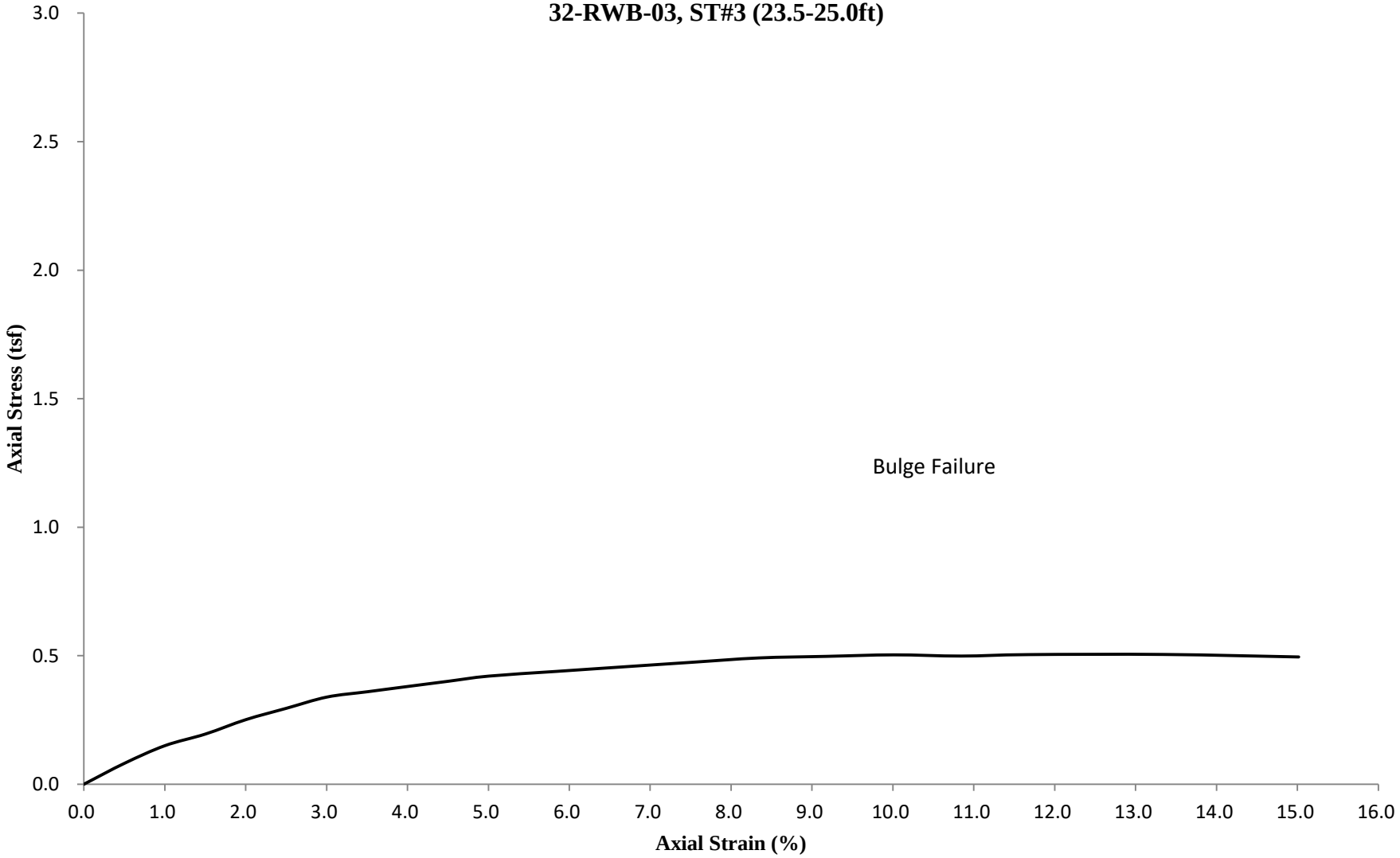
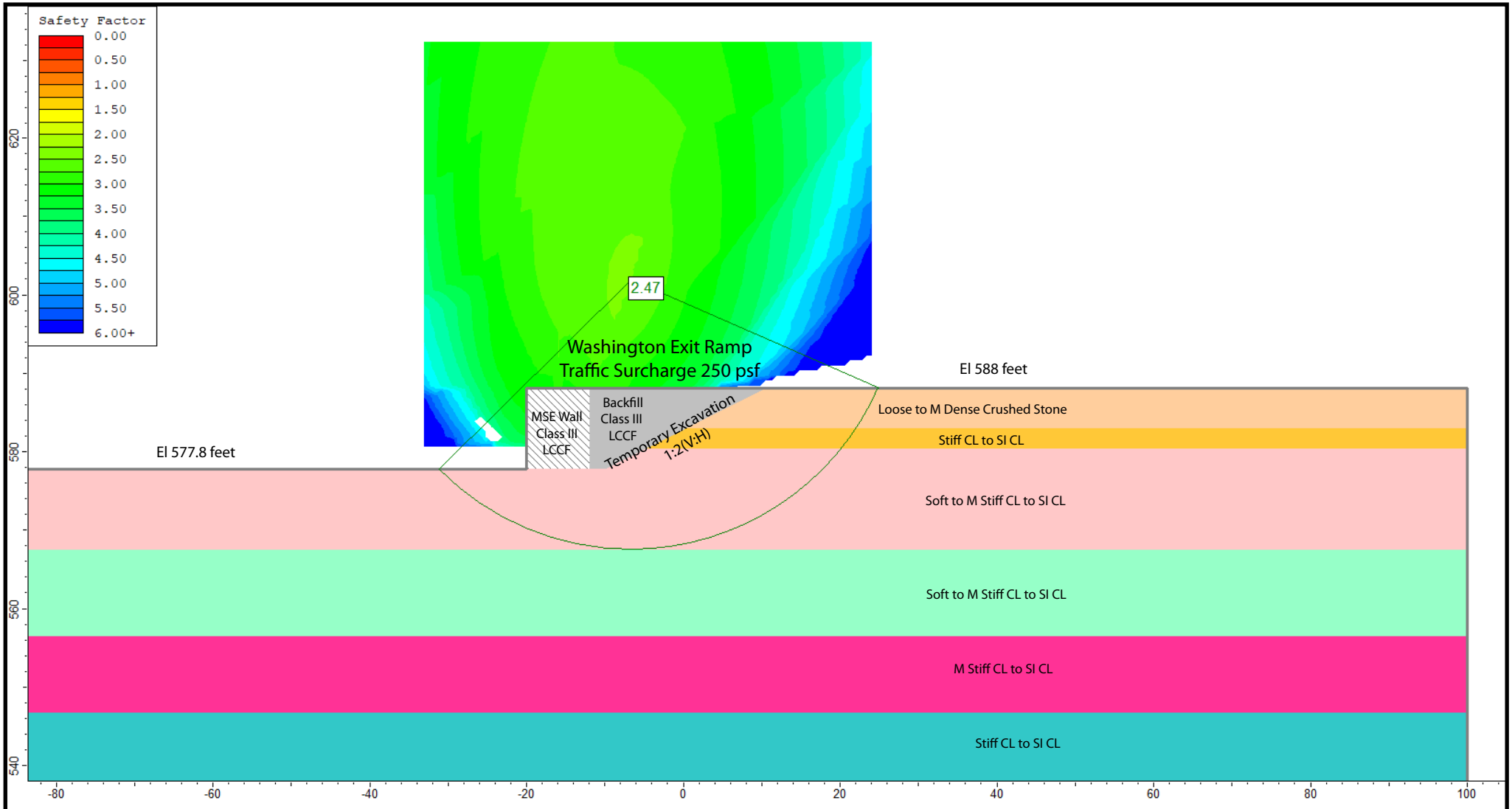
Unconfined Axial Stress v. Axial Strain
32-RWB-03, ST#3 (23.5-25.0ft)



AASHTO R18

APPENDIX C



Undrained Analysis for MSE Wall at Station 8683+30.28, Ref Borings 33-RWB-01 and VST-03

Layer ID	Description	Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Loose to M Dense CRUSHED STONE	125	0	32
2	Stiff CL to SI CL	120	1000	0
3	Soft to M Stiff CL to SI CL	110	450	0
4	Soft to M Stiff CL to SI CL	115	600	0
5	M Stiff CL to SI CL	115	900	0
6	Stiff CL to SI CL	120	1200	0

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 33, SN 016-1822, CHICAGO, IL

SCALE: GRAPHICAL | APPENDIX C-1 | DRAWN BY: NSB CHECKED BY: MWS

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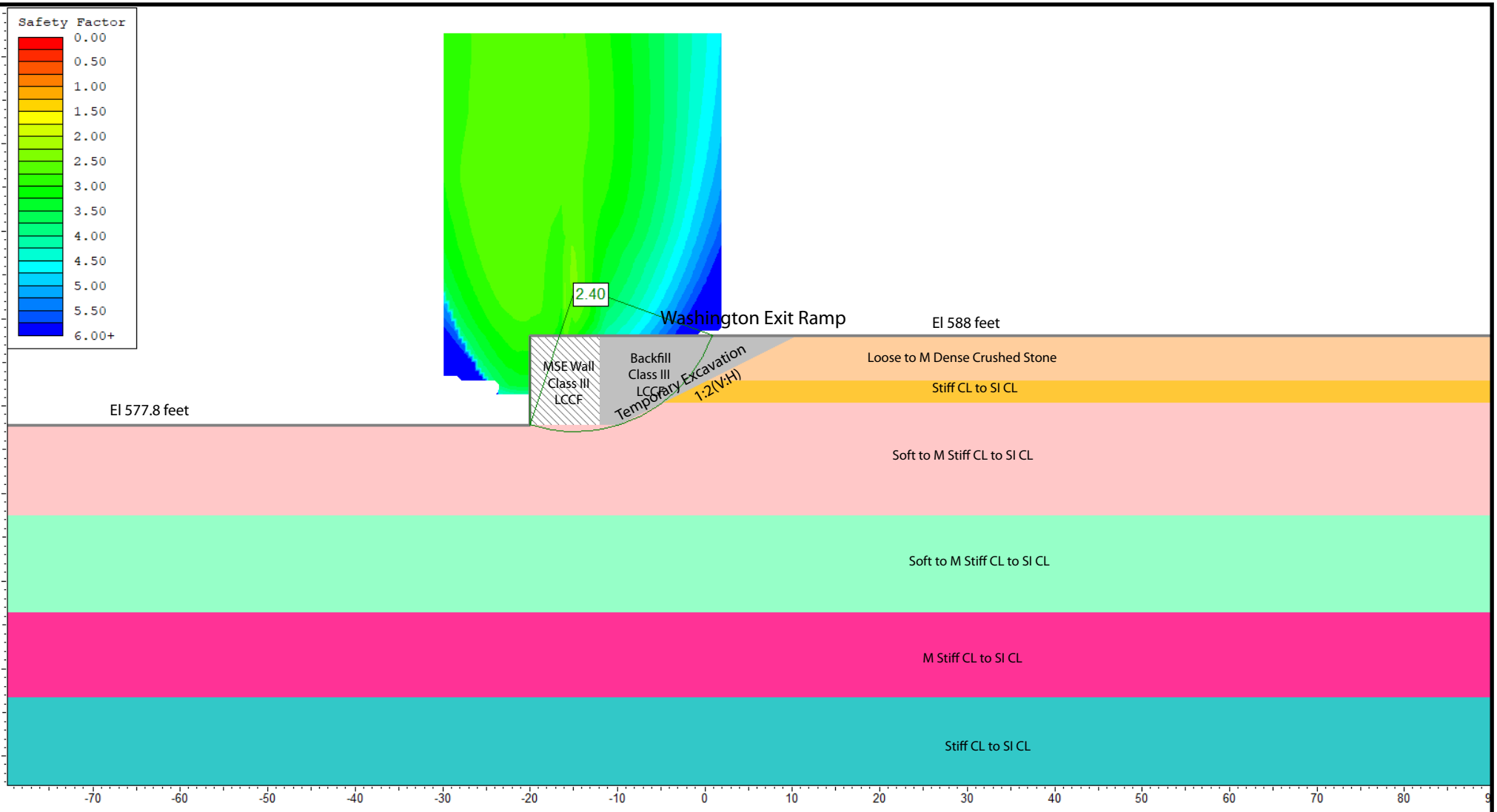

Drained Analysis for MSE Wall at Station 8683+30.28, Ref Borings 33-RWB-01 and VST-03

Layer ID	Description	Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	Loose to M Dense CRUSHED STONE	125	0	32
2	Stiff CL to SI CL	120	100	0
3	Soft to M Stiff CL to SI CL	110	0	28
4	Soft to M Stiff CL to SI CL	115	0	28
5	M Stiff CL to SI CL	115	0	29
6	Stiff CL to SI CL	120	100	30

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 33, SN 016-1822, CHICAGO, IL

SCALE: GRAPHICAL | APPENDIX C-2 | DRAWN BY: NSB CHECKED BY: MWS

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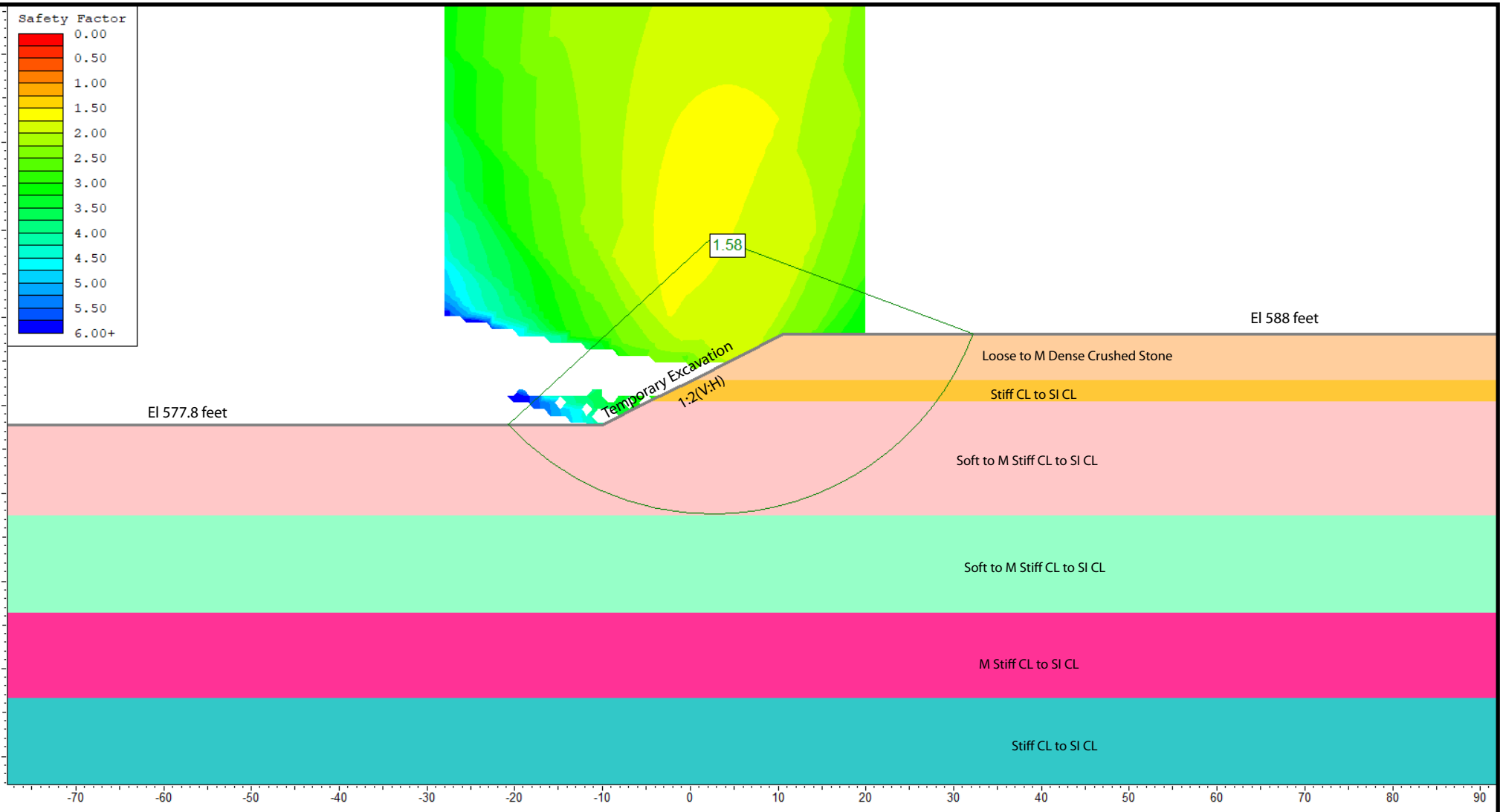

Undrained Analysis for Temporary Excavation at Station 8683+30.28, Ref Borings 33-RWB-01 and VST-03

Layer ID	Description	Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Loose to M Dense CRUSHED STONE	125	0	32
2	Stiff CL to SI CL	120	1000	0
3	Soft to M Stiff CL to SI CL	110	450	0
4	Soft to M Stiff CL to SI CL	115	600	0
5	M Stiff CL to SI CL	115	900	0
6	Stiff CL to SI CL	120	1200	0

GLOBAL STABILITY ANALYSIS: CIRCLE INTERCHANGE RECONSTRUCTION, RETAINING WALL 33, SN 016-1822, CHICAGO, IL

SCALE: GRAPHICAL | APPENDIX C-3 | DRAWN BY: NSB CHECKED BY: MWS

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FOR AECOM | 1100-04-01

APPENDIX D

Bench Mark: Set "X" on northwest corner of handhole along east edge of SB I-90/94 20 feet north of Madison Street. Elev. 596.13.

Existing Structure: Existing Retaining Wall 21. Constructed in 1957 under F.A.I. Route 90/94, Section 0202.6-IP. Cast-in-place concrete retaining wall on metal shell piles and spread footing that measures 180'-0" from Washington Boulevard SE Wingwall south to Madison Street. Maximum height from top of wall to bottom of footing measures 15'-9½". The south portion of the existing retaining wall is to be removed and replaced with an MSE wall. The top part of the north portion of the wall is to be removed and replaced with a concrete parapet and anchorage slab.

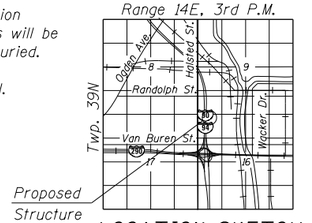
Traffic on NB Washington Exit Ramp will be detoured during construction.

No Salvage.

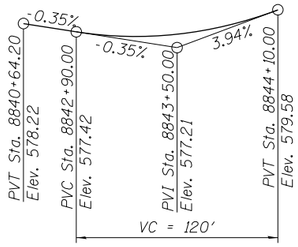
Notes:
1.) Wall offsets are measured from the ℄ of NB Washington Exit Ramp to the front face of the existing wall or precast panels.
2.) F.F. denotes Front Face.
3.) B.F. denotes Back Face.
4.) Repairs to front face of existing wall are to be made according to the Wall Condition Report.
5.) Stainless Steel Trellises to be installed on the front face of the wall. For limits, see Elevation View. For details, see Typical Cross Section and SS Cable Wall Mount Unit Detail on Sheet 2 of 2.
6.) Proposed drainage information shown is conceptual and will be determined during final design

SCOPE OF WORK:

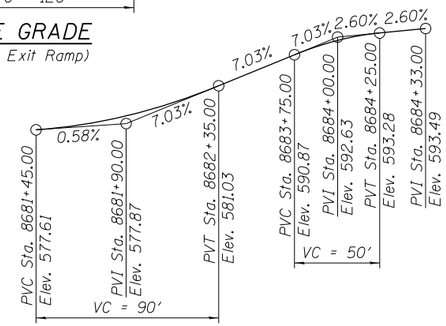
1.) Remove existing railing and wall to elevation specified in Elevation View. Existing piles will be cut to 1' below top of leveling pad and buried.
2.) Repair spalls, delaminated concrete, and cracks on the front face of existing wall.
3.) Construct MSE wall.
4.) Replace top portion of existing wall with parapet on top of anchorage slab.



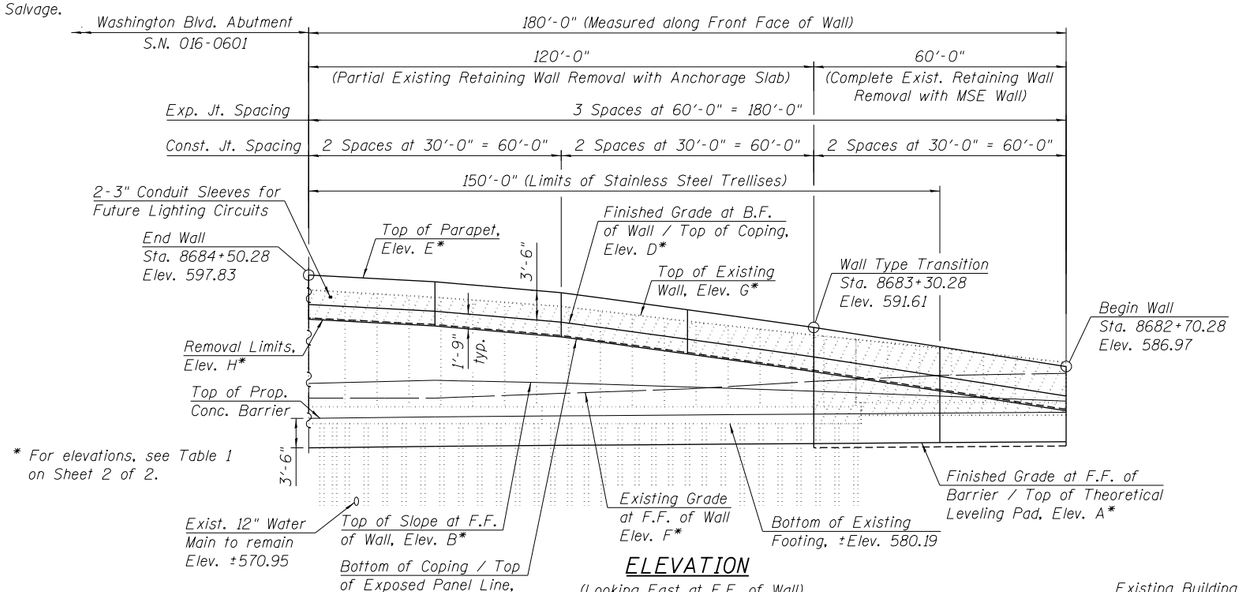
LOCATION SKETCH



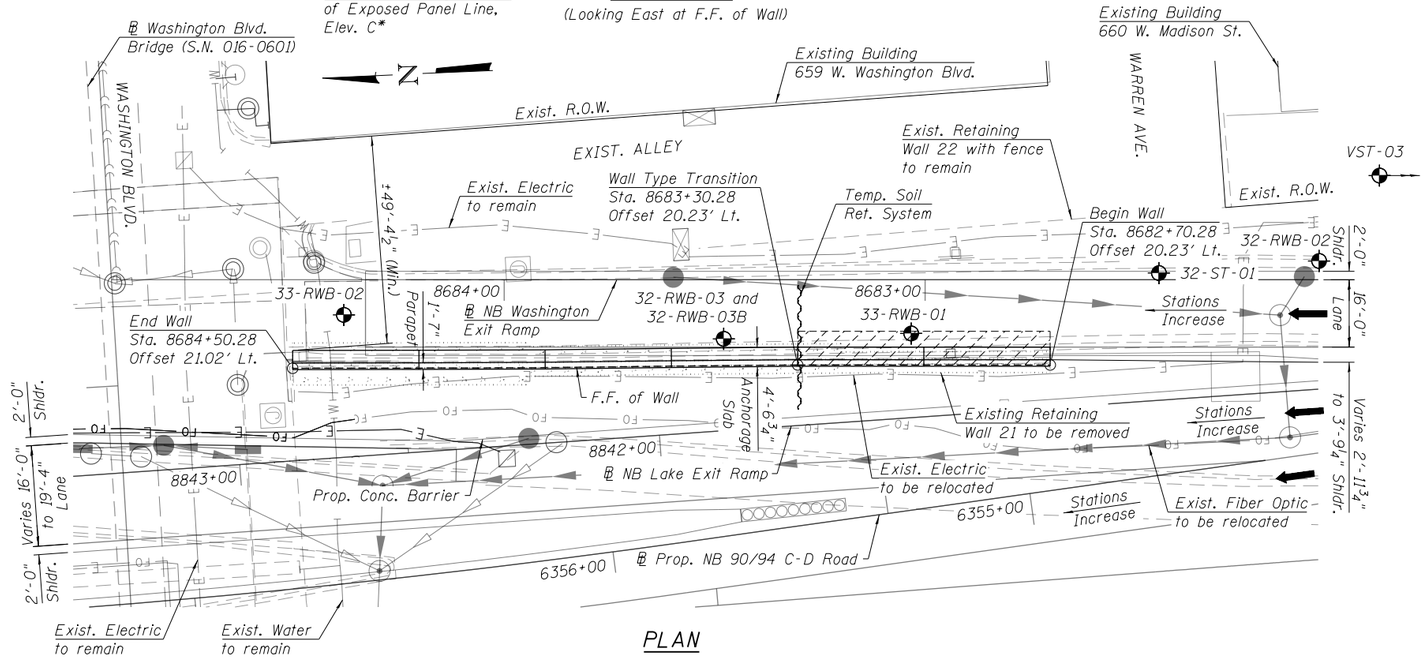
PROFILE GRADE
(℄ NB Lake Exit Ramp)



PROFILE GRADE
(℄ NB Washington Exit Ramp)



ELEVATION
(Looking East at F.F. of Wall)



PLAN

HIGHWAY CLASSIFICATION

NB Washington Exit Ramp
Functional Class: Interstate
ADT: 3,500 (2012); 4,000 (2040)
ADTT: 0 (2012); 0 (2040)
DHV: 430 (2040)
Design Speed: 30 m.p.h.
Posted Speed: 30 m.p.h.
One-Way Traffic
Directional Distribution: 100%

NB Lake Exit Ramp
Functional Class: Interstate
ADT: 8,200 (2012); 9,000 (2040)
ADTT: 312 (2012); 342 (2040)
DHV: 740 (2040)
Design Speed: 30 m.p.h.
Posted Speed: 30 m.p.h.
One-Way Traffic
Directional Distribution: 100%

DESIGN SPECIFICATIONS

2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition

2017 AASHTO LRFD Bridge Design Specifications 8th Edition

DESIGN STRESSES

FIELD UNITS
f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)

EXISTING UNITS
fc = 1,200 psi
fs = 20,000 psi (Reinforcement)

PRECAST UNITS
f'c = 4,500 psi

LEGEND:

Combined Sewer		Soil Boring	
Electric	E	Existing Catch Basin	
Ex. Storm Sewer		Proposed Catch Basin	
Prop. Storm Sewer		Existing Manhole	
Ex. Water	W	Proposed Manhole	
Ex. Fiber Optic	FO	Proposed Inlet	
Limits of Soil Reinforcement		Concrete Removal	

GENERAL PLAN
RETAINING WALL 33 ALONG NB WASHINGTON EXIT RAMP
F.A.I. RTE. 90/94 (KENNEDY EXPRESSWAY)
SECTION 2015-019R
COOK COUNTY
STATION 8682+70.28 TO STATION 8684+50.28
STRUCTURE NO. 016-1822

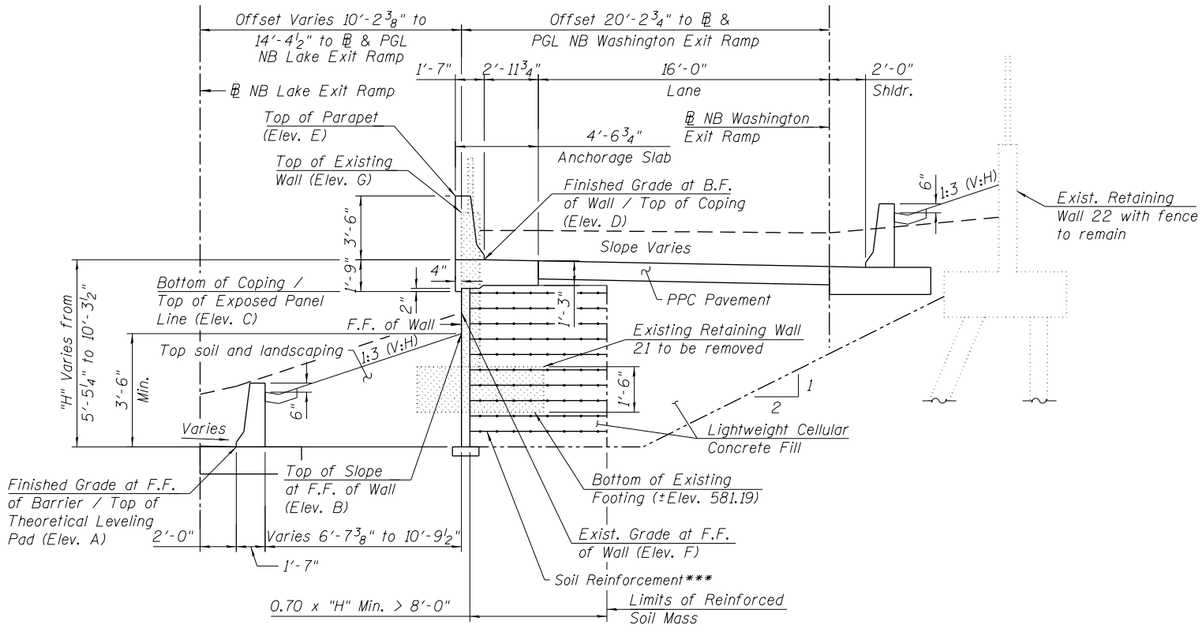
TranSystems

USER NAME = wjcolletti	DESIGNED - WJC	REVISED -	
	CHECKED - MDS/JNP	REVISED -	
PLOT SCALE = 36.0000 '/ in.	DRAWN - WJC	REVISED -	
PLOT DATE = 4/4/2019	CHECKED - MDS/JNP	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

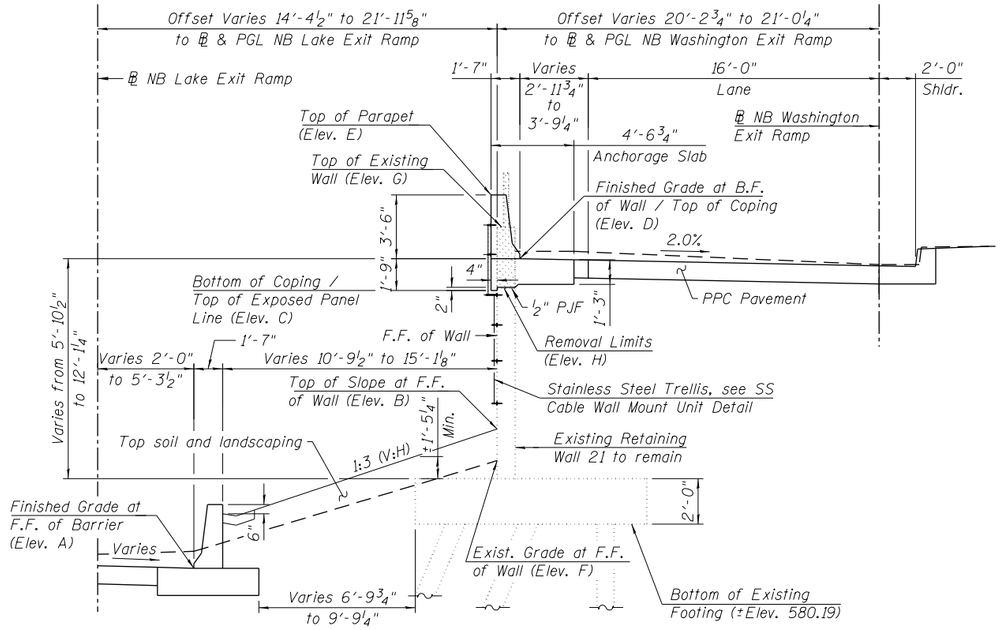
SHEET NO. 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94	2015-019R	COOK	2	1
		CONTRACT NO. 62A76		
	ILLINOIS FED. AID PROJECT			



TYPICAL CROSS SECTION

(Sta. 8682+70.28 to Sta. 8683+30.28)
(Looking Upstation)



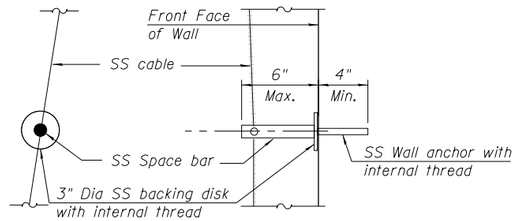
TYPICAL CROSS SECTION

(Sta. 8683+30.28 to Sta. 8684+50.28)
(Looking Upstation)

TABLE 1 - WALL ELEVATIONS

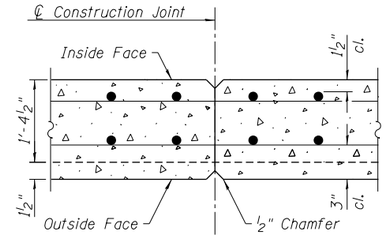
	Station	Offset	Elevation A	Elevation B	Elevation C	Elevation D	Elevation E	Elevation F	Elevation G	Elevation H	Wall Type
	8682+70.28	20.23' Lt.	578.03	582.86	581.72	583.47	586.97	586.15	587.44	-	MSE Wall
	8683+00.28	20.23' Lt.	577.92	583.45	584.06	585.81	589.31	585.91	589.15	-	
*	8683+30.28	20.23' Lt.	577.82	584.04	586.36	588.11	591.61	585.20	590.70	-	
**	8683+30.28	20.23' Lt.	577.82	584.04	586.36	588.11	591.61	585.20	590.70	586.48	Exist. Wall with Anchorage Slab
	8683+60.28	20.51' Lt.	577.71	584.54	588.47	590.22	593.72	584.30	592.35	588.60	
	8683+90.28	20.87' Lt.	577.61	585.02	590.48	592.23	595.73	583.78	594.11	590.61	
	8684+20.28	20.97' Lt.	577.47	585.32	591.79	593.54	597.04	583.22	595.19	591.92	
	8684+50.28	21.02' Lt.	577.30	584.96	592.58	594.33	597.83	583.22	596.06	592.71	

Elevation A- Finished Grade at F.F. of Barrier / Top of Theoretical Leveling Pad
Elevation B- Top of Slope at F.F. of Wall
Elevation C- Bottom of Coping / Top of Exposed Panel Line
Elevation D- Finished Grade at B.F. of Wall / Top of Coping
Elevation E- Top of Parapet
Elevation F- Existing Grade at F.F. of Wall
Elevation G- Top of Existing Wall
Elevation H- Removal Limits
* Elevations just to the right of joint
** Elevations just to the left of joint



SS CABLE WALL MOUNT UNIT DETAIL

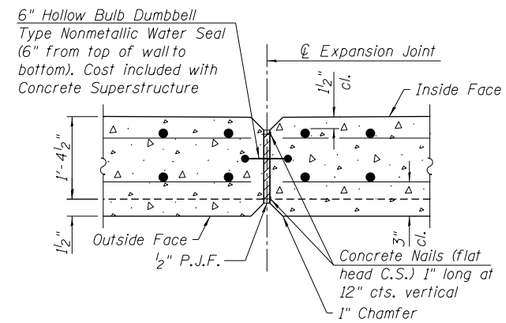
Note: Type, size and location of SS Wall Anchor shall be determined in final design.



CONSTRUCTION JOINT DETAILS

(NTS)

*** The M.S.E. Wall supplier's internal stability design shall account for the anchorage slab's bearing pressure surcharge of 1.0 ksf and horizontal sliding force of 0.83 kips/ft of wall.



EXPANSION JOINT DETAILS

(NTS)

LEGEND:

B.F. - denotes Back Face.
F.F. - denotes Front Face.
- Concrete Removal

CROSS SECTION AND DETAILS
RETAINING WALL 33 ALONG NB WASHINGTON EXIT RAMP
F.A.I. RTE. 90/94 (KENNEDY EXPRESSWAY)
SECTION 2015-019R
COOK COUNTY
STATION 8682+70.28 TO STATION 8684+50.28
STRUCTURE NO. 016-1822

TranSystems

USER NAME = wjcolletti	DESIGNED - WJC	REVISED -
	CHECKED - MDS/JNP	REVISED -
PLOT SCALE = 0.17 ' / in.	DRAWN - WJC	REVISED -
PLOT DATE = 4/4/2019	CHECKED - MDS/JNP	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

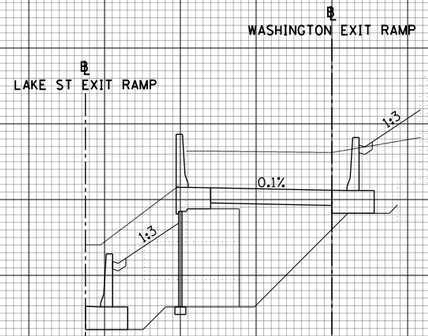
SHEET NO. 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94	2015-019R	COOK	2	2
		CONTRACT NO. 62A76		
		ILLINOIS FED. AID PROJECT		

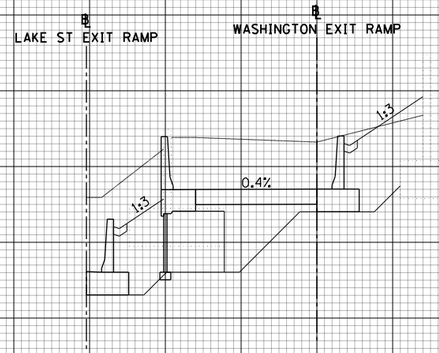
APPENDIX E

FINAL SURVEY	NOTE BOOK	NO.
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		

BY	DATE



8683 + 00.28



8682 + 70.28

VERT: 1"=5'
HORIZ: 1"=10'

NOTES

EXISTING UTILITIES SHOWN ARE BASED ON SUE LOCATE INFORMATION. DEPTHS OF UTILITIES ARE BASED ON ASSUMED DEPTHS OR RECORD INFORMATION IF AVAILABLE. EXTENTS OF UNDERGROUND STRUCTURES ARE ESTIMATED BASED ON UTILITY ATLAS INFORMATION. EXISTING AND PROPOSED SEWER IS SHOWN BASED ON SURVEY DATA, ATLAS INFORMATION AND THE PROPOSED PLANS.

ORIGINAL SURVEY	NOTE BOOK	NO.
SURVEYED		
PLOTTED		
TEMPLATE		
AREAS		
AREAS CHECKED		

BY	DATE

TranSystems

D162A76-EXH-XS-ZZ-WRK.dgn	DESIGNED -	REVISED -
USER NAME = zmzaranko	DRAWN -	REVISED -
PLOT SCALE = 20.0000 ' / in.	CHECKED -	REVISED -
PLOT DATE = 3/8/2019	DATE - 9-10-2018	REVISED -

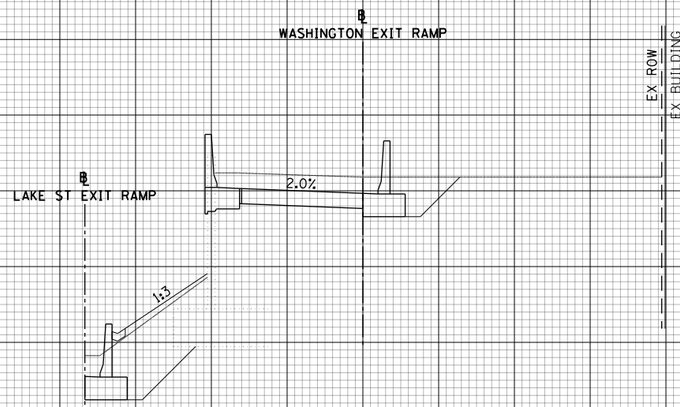
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CROSS SECTIONS
RETAINING WALL NO. 33

SCALE: 10:H 5:V | SHEET OF SHEETS | STA. | TO STA.

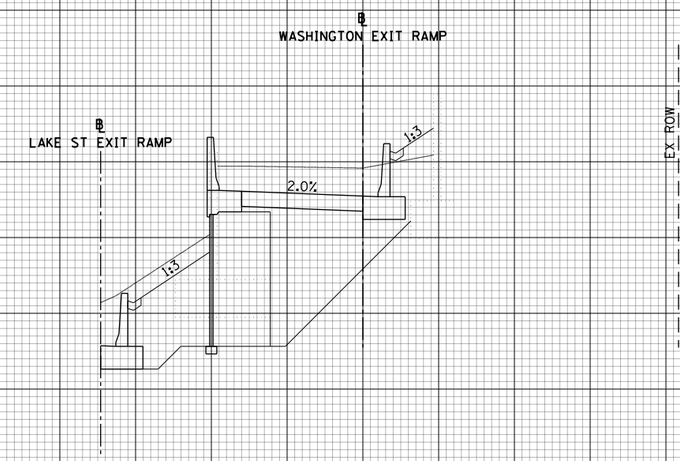
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-D18R	COOK	2109	5
		CONTRACT NO. 62A76		
	ILLINOIS	FED. AID PROJECT		

FINAL SURVEY	BY	DATE
NOTE BOOK	SURVEYED	
NO.	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	



8683 + 60.28

ORIGINAL SURVEY	BY	DATE
NOTE BOOK	SURVEYED	
NO.	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	



8683 + 30.28

NOTES

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VERT: 1"=5'
HORIZ: 1"=10'

TranSystems

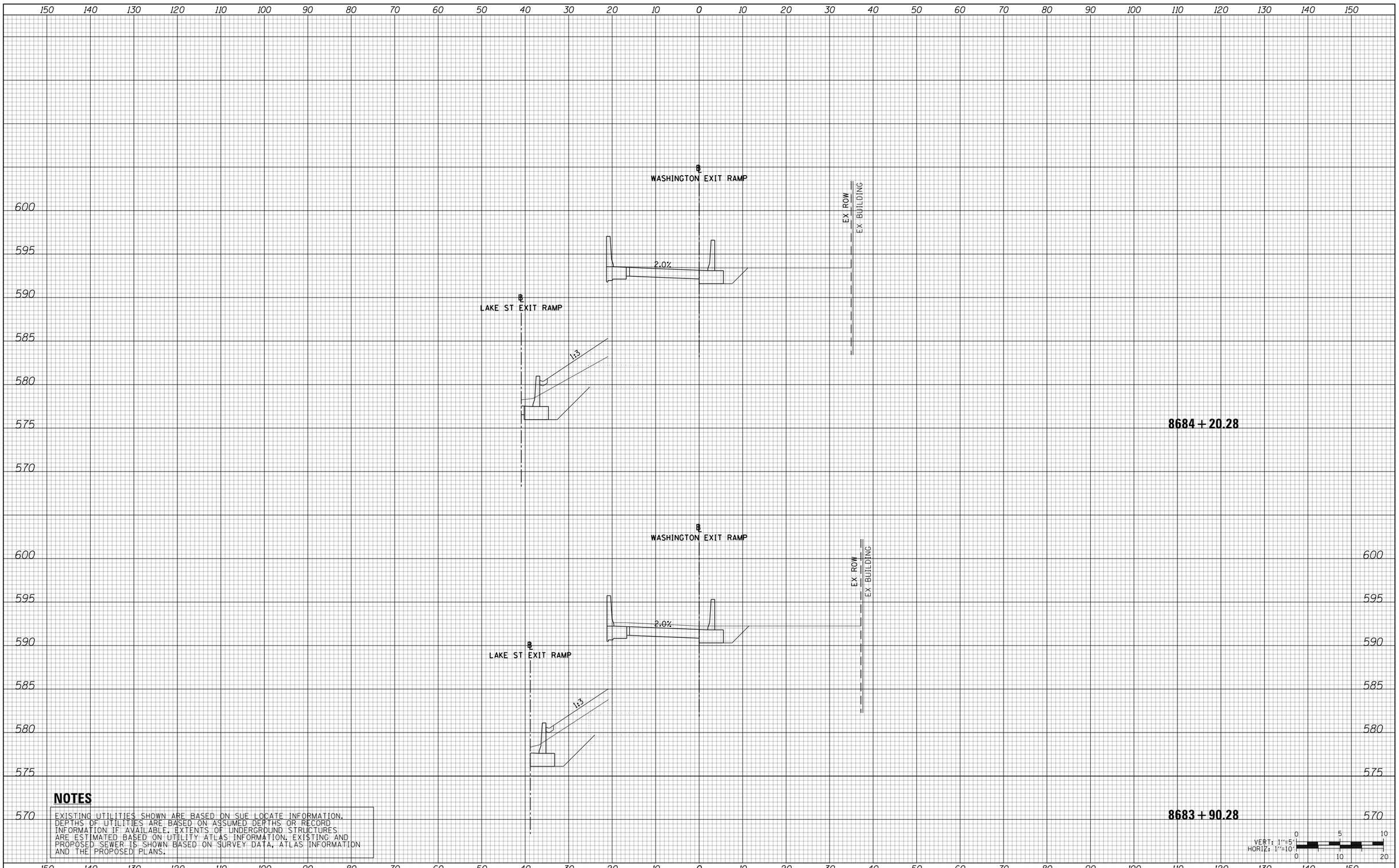
D162A76-EXH-XS-ZZ-WRK.dgn	DESIGNED -	REVISED -
USER NAME = zmzaranko	DRAWN -	REVISED -
PLOT SCALE = 20.0000 ' / in.	CHECKED -	REVISED -
PLOT DATE = 3/8/2019	DATE - 9-10-2018	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CROSS SECTIONS
RETAINING WALL NO. 33

SCALE: 10:H 5:V | SHEET OF SHEETS | STA. TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-D18R	COOK	2109	6
		CONTRACT NO. 62A76		
	ILLINOIS	FED. AID PROJECT		



FINAL SURVEY
NOTE BOOK
NO.
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
BY
DATE

ORIGINAL SURVEY
NOTE BOOK
NO.
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
BY
DATE

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VERT: 1"=5'
HORIZ: 1"=10'

TranSystems

D162A76-EXH-XS-ZZ-WRK.dgn	DESIGNED -	REVISED -
USER NAME = zmzaranko	DRAWN -	REVISED -
PLOT SCALE = 20.0000 ' / in.	CHECKED -	REVISED -
PLOT DATE = 3/8/2019	DATE - 9-10-2018	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CROSS SECTIONS
RETAINING WALL NO. 33

SCALE: 10:H 5:V | SHEET OF SHEETS | STA. TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-D18R	COOK	2109	7
		CONTRACT NO. 62A76		
	ILLINOIS FED. AID PROJECT			

FINAL SURVEY	
NOTE BOOK	
NO.	

SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED

BY

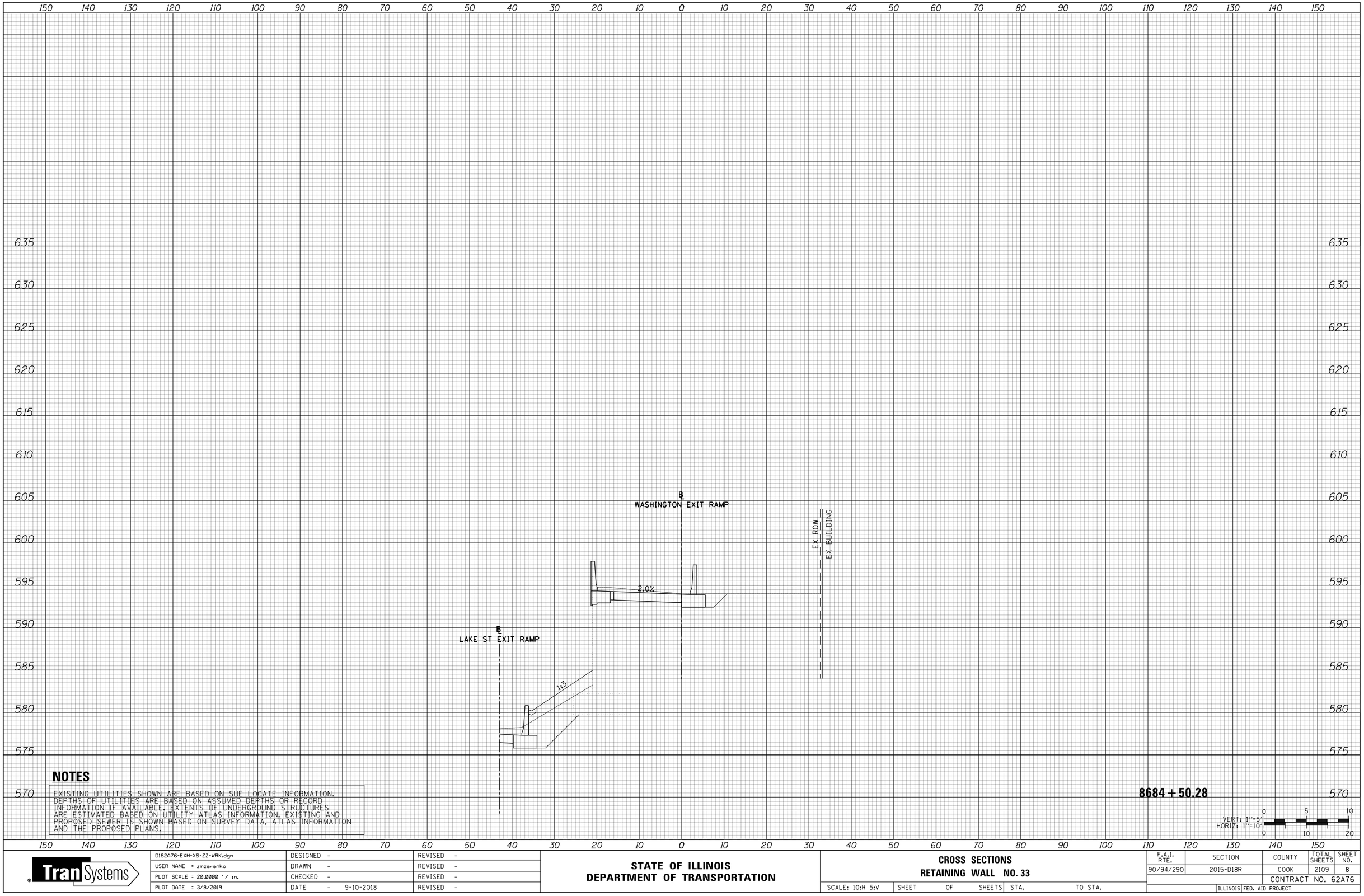
DATE

ORIGINAL SURVEY	
NOTE BOOK	
NO.	

SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED

BY

DATE



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TranSystems

D162A76-EXH-XS-ZZ-WRK.dgn	DESIGNED -	REVISED -
USER NAME = zmzaranko	DRAWN -	REVISED -
PLOT SCALE = 20.0000 ' / in.	CHECKED -	REVISED -
PLOT DATE = 3/8/2019	DATE - 9-10-2018	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CROSS SECTIONS
RETAINING WALL NO. 33

SCALE: 10:H 5:V | SHEET OF SHEETS | STA. | TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2015-D18R	COOK	2109	8
		CONTRACT NO. 62A76		
		ILLINOIS	FED. AID PROJECT	